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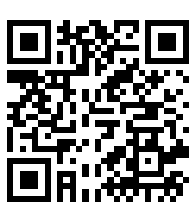

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THE

NAVAL ANNUAL.

1919.

EDITED BY

EARL BRASSEY, D.C.L., A.I.N.A.,

Honorary Fellow of Balliol; Commander of the Order of the Crown of Italy,

AND

JOHN LEYLAND.

1919.

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PREFACE.

It was one of the last wishes of the founder of the *Naval Annual* that publication should be resumed at the conclusion of the war. When the command of a second line Yeomanry Regiment prevented me from carrying on the work of Editor, which I had done for over 20 years, my father stepped into the breach, and the volumes published in 1915 and 1916 were prepared under his supervision with the help of Mr. Leyland. The information as to Naval progress given in these volumes was, for obvious reasons, incomplete, and we decided in 1917 not to attempt to prepare any further volumes during the war. Now that the great struggle, in which the British Navy played such a decisive part, has been brought to a conclusion, the time has come when Naval events and Naval progress during the war may be reviewed. It would have been impossible to do this in a manner worthy of the subject without the cordial assistance of the Admiralty. Information derived from Navy Estimates, official documents, and other public sources, on which we mainly relied in pre-war days, was not available. French, United States, Japanese and Italian Naval representatives have given all the assistance in their power. We are greatly indebted also to the co-operation of the Naval authorities of nearly every allied and neutral country in the world. We have been fortunate in securing the help of several new contributors. The volume includes a complete record of the work of the Navy in the war and of the operations of the Allied Navies. Progress in naval construction up to the present time is described in detail, as are the advances in engineering and ordnance, which have been so remarkable. The *personnel* of the Navy is dealt with fully with reference to organisation, services, numbers, and training in each year of the hostilities, as are the subjects of education and "welfare" conditions. There are chapters on the systematic work of convoy and on anti-submarine measures and devices. Admiralty developments during the war, especially with reference to the important distinction between the functions of Operations and Maintenance,

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and Admiralty administration are a special feature. The Mercantile Marine, Auxiliary Patrol, and mine-sweepers are given their due place. Ship lists and diagrams have been completed to the present time. Part IV. contains the Navy Estimates, Jutland, Zeebrugge, and Ostend despatches, particulars of ships present in the battle of Jutland, losses, personal and material, during the war, exhaustive tables of Army overseas transport, and other information.

Owing to pressure of other public work I have not been able to take as large a part in the preparation of the present volume as in pre-war days. If the *Naval Annual* of 1919 is worthy of the occasion it will be mainly due to the assistance of the Admiralty and to our faithful collaborators of many years' standing—Mr. Leyland, Commander C. N. Robinson, R.N., and Mr. Alexander Richardson, M.P.

BRASSEY.

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NOTE.

It has recently been intimated to the Fleet that about 170 obsolete vessels of nearly every class are to be sold out of the Service as soon as arrangements can be made and their armaments and equipments be conveniently removed. The battleship list includes the Redoubtable (ex-Revenge), being the last of the old Royal Sovereign class, built under the Naval Defence Act; the Jupiter (Majestic class), whose sisters have already gone from the Service — the Majestic sunk off Gallipoli, and the others scrapped, and their armaments mounted in the monitors; the Albion and Canopus (Canopus class); the Exmouth, Duncan, and Albemarle, last remaining ships of the Duncan class; and the Africa, Dominion, and Hindustan (King Edward VII. class).

Of armoured cruisers, the Duke of Edinburgh has been disposed of, but the Achilles and Cochrane are at present retained, as well as the Minotaur, Devonshire, and Monmouth classes. The remaining cruisers of the Drake and Cressy classes are to be sold. Of light cruisers, the Diadems, Powerfuls, and Edgars are non-effective—the Argonaut, Endymion and Edgar are to be disposed of forthwith—and the Challenger, Highflyer, Pelorus, Arrogant, Talbot, Astræa and Apollo classes, with the exception of a few vessels retained for special purposes, will soon go out of the Service.

All the destroyers of the A to F classes are condemned, and twenty-one are to be disposed of immediately, and seventy-six others as soon as possible. Of submarines, no boats anterior to the E class are now retained in the lists.

With reference to the above announcement, the Duke of Edinburgh should be removed from the comparative table on p. 100. Through a *lapsus calami* the Pathfinder appears in the table on p. 102.

United States battleship Tennessee launched, New York Navy Yard, April 30th.

May, 1919.

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PART I.

CHAPTER I.

The World War.

Narrative of Naval Events and Incidents.

(*Continued from the* Naval Annual *of* 1916.)

The history of the conflict at sea which appeared in the two volumes of the *Naval Annual* for 1915 and 1916 covered the suppression of the German commerce raiders in the outer oceans, and the Battle of the Falklands, which, by the destruction of von Spee's squadron, deprived the corsairs of their support, and drove those which were not captured into internment. The beginning of the submarine campaign, including such deplorable outrages as the sinking of the Lusitania, and the manner in which the U-boat menace was met by methods devised in the first months of the war, was described. The story of the Gallipoli enterprise was also recorded. The period covered by the present review is from March, 1916, to December, 1918.

In the spring of 1916 the Grand Fleet, still enveloped in the mists of the north, was acting, in the phrase of the King, as the "sure shield of Britain," and by the threat of its latent strength was holding the High Seas Fleet of Germany. The latter, unlike the British forces, which made continued sweeps of the North Sea, both for training and aggressive action, almost entirely refrained from appearing outside the mined and fortified positions which it had in the Heligoland Bight. In other theatres of war, in the Baltic as in the Adriatic, the command of the sea was held by the Allies, although there, as in the North Sea, raiding took place. Generally, the Mediterranean traffic, which had not been reduced by the withdrawal from Gallipoli and the opening of the Salonika campaign, was beginning to suffer more heavily from the U-boats, which first made their appearance at the time when the Allied ships were based on Mudros. The situation was anxious, but hopeful in that the advantage in the struggle for the control of the maritime routes—upon which everything else in the war depended—had been consistently and continuously on the Allied side.

The opening event of the present narrative will be the Battle of Jutland on May 31, 1916. After long months of expectation on the

Battle of Jutland.

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part of the public, this came as a surprise to the world. The despatch of Admiral Sir John Jellicoe, Commander-in-Chief of the Grand Fleet, with the report to him of Vice-Admiral Sir David Beatty, commanding the Battle-cruiser Fleet, was published in the *London Gazette* on July 7, 1916, and will be found in Part IV. of this volume. A complete account of the action was given in Lord Jellicoe's book,* published on February 12, 1919. The German official report was published in the German Press on July 1–5, 1916.

Opening the engagement.

On May 30th, the Grand Fleet had left its bases in pursuance of the general policy of periodical sweeps through the North Sea. Early in the afternoon of the 31st, Sir David Beatty's forces were scouting to the southward of the Battle Fleet. His forces consisted of the Battle-cruiser Fleet, including six battle-cruisers, twelve light cruisers, and twenty-seven destroyers, with two flotilla leaders and a seaplane-carrier; and the Fifth Battle Squadron, under Rear-Admiral Hugh Evan-Thomas, composed of four Queen Elizabeths. The weather was fine, with a light wind from the south-east, the sea calm, and the visibility fairly good. On the morning of May 31st, the German High Seas Fleet had left its base and proceeded towards the Skager Rak on an "enterprise directed northward." As on the British side, a reconnoitring force, consisting of five battle-cruisers under Vice-Admiral Hipper, with smaller units, was thrown out in advance of the main body, which included three battle squadrons, the whole being under Vice-Admiral Scheer. At 2.20 p.m. the presence of German vessels was reported to Sir David Beatty from the Galatea (Commodore E. S. Alexander-Sinclair), and a seaplane was sent up from the Engadine (Lieut.-Commander C. G. Robinson) at 3.8 p.m. piloted by Flight-Lieut. F. J. Rutland, and her first reports were received at 3.30 p.m. The first engagement took place between the light cruisers on either side, which engaged each other at long range. Vice-Admiral Beatty, on an E.S.E. course (after at first advancing in the direction of Horn Reef to get between the enemy and his base) formed line of battle at 3.30 p.m., at a speed of 25 knots, slightly converging on the German battle-cruisers, then 23,000 yards distant. The battle-cruisers opened fire at a range of about 18,500 yards at 3.48 p.m., the action being fought on a southerly course until 4.38 p.m., when the enemy's Battle Fleet was reported ahead by the Southampton (Commodore W. E. Goodenough). The mean direction of the battle during this time was S.S.E.; the German battle-cruisers steering a parallel course, distant about 18,000 to 14,500 yards. The Fifth Battle Squadron came into action at 4.8 p.m., at a range of

* "The Grand Fleet, 1914-1916. Its Creation, Development and Work." (Cassell & Co.)

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20,000 yards, and about this time it appeared that the British ships passed through a screen of enemy submarines. At 4.15 p.m., eight destroyers of the Thirteenth Flotilla, with two of the Ninth and two of the Tenth Flotillas, moved out to make a torpedo attack on the enemy, and simultaneously the Germans launched a similar attack, a light cruiser and fifteen destroyers being engaged by the British boats before they could reach a favourable position to fire torpedoes. The Germans were driven back with the loss of two of their boats; and, pressing home the attack on the enemy battle-cruisers, eight of the British destroyers fired torpedoes at them. With great determination, Commander the Hon. E. B. S. Bingham, in the Nestor, with the Nomad and Nicator, closed to a range of 6000 to 5000 yards, under heavy fire from the German secondary batteries, and fired two torpedoes. Later, when the enemy turned sixteen points, and these destroyers found themselves within range of his battleships, they gallantly held on, and attacked the second ship of the German battle line at 3000 yards. Both the Nestor and Nomad were disabled, and eventually sunk by the German battleships as they came up. Sir David Beatty considered these destroyer attacks worthy of the highest traditions of the Navy.

Some British losses.

In this first phase of the action the Indefatigable and Queen Mary were sunk. The former was hit at about 4.6 p.m. by a salvo which evidently exploded her magazine; the latter was similarly struck twenty minutes later, a salvo exploding abreast of Q turret and firing a magazine. On sighting the German Battle Fleet at 4.42, Admiral Beatty, having recalled the destroyers, turned north. In pursuing the enemy battle-cruisers he had necessarily and unavoidably increased the distance between his force and the British Battle Fleet. His first duty of reconnoitring the composition and direction of the German main force had now been fulfilled, however, and in turning north he was closing the British Battle Fleet, then about 50 miles away, at the rate of about 45 miles per hour.

Fifth Battle Squadron engages German Fleet.

In the second phase, from 4.42 p.m. to 6.14 p.m., the German ships were frequently obscured by the mist, and the action was intermittent, but the enemy received severe punishment, and one of his battle-cruisers hauled out of the line damaged. The Fifth Battle Squadron had turned up astern of the British battle-cruisers at 4.57 p.m., and came under fire from the leading enemy battleships. During the run northward, the flagship Barham, which had received her first hit at 4.23 p.m., and the Valiant, supported the British battle-cruisers by their fire; whilst the Warspite and Malaya, the two rear ships, engaged the leading German battleships as long as their guns would bear, at a range of about 19,000 yards. A surprising

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feature of the steaming of this squadron, which had a designed speed of 25 knots, was that, when going at their utmost speed, the ships found great difficulty in increasing their distance from the enemy's Third Battle Squadron (König class), which attained 23 knots for a short period. From 5 to 6 p.m., when the action continued on a northerly course, the range was reported by Sir David Beatty at about 14,000 yards. A destroyer attack on the enemy battle-cruiser line was made at 5.10 p.m. by the Moresby, which, with the Onslow, had just returned from assisting the Engadine with her seaplane, and shortly afterwards an enemy ship was seen to be heavily on fire. For about half an hour after 5.12 p.m., the British battle-cruisers ceased fire altogether owing to the German ships being invisible. At 5.35 p.m. Sir David Beatty began to haul gradually to the north-eastward, keeping 14,000 yards distant from the enemy, who was receiving severe punishment at the head of his line, and who had begun hauling to the eastward. The German Commander was also probably acting on information from his light cruisers, which were engaged with the Third Battle-cruiser Squadron, under Rear-Admiral the Hon. H. L. A. Hood. This Squadron had put to sea with the Battle Fleet, under Sir John Jellicoe, and at 4 p.m. was ordered, by the Commander-in-Chief, to proceed at full speed to reinforce Sir David Beatty. Owing to the difference in reckoning between the Lion and Iron Duke, this squadron pressed too far to the eastward, and it was not until 5.30 p.m. that it observed flashes of gunfire, and the Chester, on being sent to investigate, engaged three or four enemy light cruisers for about twenty minutes with great skill and gallantry, rejoining Sir Horace Hood at 6.5 p.m.

Movements northward and eastward.

On sighting, at 5.56 p.m., the leading battleships of the Grand Fleet, bearing north 5 miles, Sir David Beatty altered course to east and proceeded at utmost speed, which brought the range of the enemy down to 12,000 yards. At 6.10 Admiral Hood's battle-cruisers were sighted, and ordered to take station ahead. At 6.16 p.m. Admiral Hood formed his squadron into single line ahead of the Lion, and began a severe engagement at only 8600 yards range against the enemy battle-cruisers. At 6.33 p.m. the Invincible was struck in one of her turrets, and a heavy explosion immediately followed which destroyed the ship.

Third Battle-cruiser Squadron's action.

Sir John Jellicoe's battle squadrons were advancing in six columns of divisions, the First Division, or port wing column, being led by the King George V. (Vice-Admiral Sir Thomas M. Jerram); the Third Division by the Fleet flagship Iron Duke; and the Sixth Division, or starboard wing column, by the Marlborough (Vice-Admiral Sir Cecil Burney). At 6.16 p.m. the Commander-in-Chief formed line

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of battle on the port wing column, reducing speed to 14 knots to allow Sir David Beatty's ships, which had altered course to the east in order to turn the van of the German Fleet, to pass ahead of the battle squadrons.

First Battle Squadron opens fire.

The First Battle Squadron, under Vice-Admiral Sir Cecil Burney, came into action, at 6.15 p.m., with the enemy's Third Battle Squadron at a range of about 11,000 yards, and administered severe punishment, both to the battleships and to the battle-cruisers and light cruisers which were also engaged. The particularly rapid and effective fire of the flagship Marlborough, Captain G. P. Ross, is mentioned by the Commander-in-Chief. At 6.54 the Marlborough was hit by a torpedo and took a list to starboard of some seven degrees. Continuing in action, however, she avoided three more torpedoes shortly afterwards, and re-opened fire at 7.3 p.m. The ships of the First Squadron were afforded more opportunities for effective fire than the rest of the Battle Fleet, and Sir John Jellicoe said that the fullest use was made of these opportunities, which proved the high efficiency of the squadron.

Deployment of the Grand Fleet.

The deployment of the Grand Fleet was completed at about 6.38 p.m., by which time the Fifth Battle Squadron, under Rear-Admiral Evan-Thomas, had taken station astern of the First Battle Squadron. Speed had already been increased to 17 knots, which was subsequently maintained. It was originally the intention of Rear-Admiral Evan-Thomas, when he sighted the Marlborough but could not see the other battleship columns, to take station ahead of that ship, but realising that she was leading the starboard wing column, and that the Fleet was deploying to port, he decided to make a large turn of his squadron to port to form astern of the First Battle Squadron. The turn was well executed, but the helm of the Warspite unfortunately jammed, and coming under a heavy fire she received considerable injury. One good effect was that the enemy's attention was distracted from the disabled Warrior, then in close proximity, so that the latter vessel was able to get clear, but she sank eventually after being towed for many hours by the Engadine, which vessel gallantly saved her crew.

Intermittent action with German Fleet.

In the account of the battle in his book, Lord Jellicoe states that at 6.50 p.m., as the range was apparently opening, course was altered by signal to south "by divisions" in order to close the enemy. This brought the enemy's line into view once more, and from 7 to 7.30 p.m. the Battle Fleet was in action whenever the German battleships or battle-cruisers could be distinguished in the haze, which was very baffling. The range varied from 15,000 yards at the van to 8500 in the rear. At 7.5 p.m. the whole battle line was turned together

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three more points to starboard to close the range further, but five minutes later a destroyer attack was observed to be launched by the enemy. To clear the torpedoes, the Fleet was turned to port by sub-divisions, first two points, and then, as this was insufficient, two points more. About twenty torpedoes were observed to cross the track of the Battle Fleet, but all were avoided by the skilful handling of the ships by their captains. The total amount by which the range was opened by the turns was about 1750 yards. The battle-cruisers under Sir David Beatty were unaffected by the torpedo attacks, and thus were able to continue in closer range to the enemy, but it was only possible for them to keep in action for some six minutes after 7.30 p.m. The reason for this was that, under cover of the destroyer attacks, and aided by heavy smoke-screens, the Germans turned away eight points and showed no further disposition to fight.

German retirement from battle.

The action between the Battle Fleets lasted intermittently for about two hours, obscured by low-lying clouds, mist, and smoke from the funnels and guns. The Germans, however, from the moment they sighted Rear-Admiral Hood's battle-cruisers and mistook them for the Grand Fleet battleships, pursued retiring tactics, and eventually escaped in the mist and darkness, aided by smoke-screens from their small craft.

Third Cruiser Squadron's engagement.

The Cruiser Squadrons accompanying the Grand Fleet were disposed as an advanced cruiser line, which, at 5 p.m., was about 16 miles ahead of the Battle Fleet. Rear-Admiral H. L. Heath, commanding the Second Cruiser Squadron in the Minotaur, was senior officer of the cruiser line; and Rear-Admiral Sir Robert Arbuthnot, in the Defence, commanded the Third Cruiser Squadron. At 5.47 p.m., three or four enemy light cruisers were sighted from the Defence, and this ship, with the Warrior astern, engaged them, closing to 5500 yards. In so doing, Sir Robert Arbuthnot in the Defence came, in the gathering smoke and mist, within range of the enemy's battle-cruisers, and at 6.16 p.m. the Defence, struck by two salvoes in quick succession, blew up and sank. The Warrior, of the same squadron, was also badly damaged, but hauled out of action. Some doubt surrounds the exact fate of the Black Prince, of this squadron, which vessel, after the loss of the Defence and the disablement of the Warrior, apparently lost touch with the Fleet through being unable to see the various alterations of course, and during the night came in contact with a German squadron and was sunk by superior gunfire. During the Battle Fleet action, the Second Cruiser Squadron, under Rear-Admiral Heath, occupied a position at the van of the battle squadrons, and acted as a connecting link

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between them and the battle-cruisers, but did not have an opportunity of coming into action.

Grand Fleet night tactics.

The British Commander-in-Chief had determined not to seek a night action with the heavy ships, and he considered that with the object of keeping between the Germans and their base a southerly course would meet the situation. The Fleet was accordingly re-formed soon after 9 p.m., on a southerly course, in columns of squadrons, each column being 1 mile apart, so that they would not lose touch with each other during the night. The destroyer flotillas were placed 5 miles astern. At 9.32 p.m. the mine-laying flotilla leader Abdiel was directed to lay a minefield in an area 15 miles from the Vyl lightship, over which it was expected the High Seas Fleet would pass if the ships attempted to regain their ports during the night via the Horn Reef. Captain Berwick Curtis duly carried out this operation, and as a British submarine near the Horn Reef reported having heard several under-water explosions between 2.15 and 5.30 a.m. on June 1st, it was considered likely that some enemy ships struck these mines.

British destroyers' night actions.

The destroyer fighting during the night was stated by Lord Jellicoe to have been characterised by the splendid dash, skill, and gallantry for which the British destroyers had been conspicuous throughout the war. About 9 p.m. the Second Light Cruiser Squadron, under Commodore Goodenough in the Southampton, was attacked by destroyers, but the enemy were driven off. At 10.4 p.m., Commodore Hawksley, commanding the destroyer flotillas, in the Castor, encountered some enemy cruisers, including the Hamburg and Elbing, and torpedoes were fired which were heard to explode. Just over two hours later, the Castor sighted a German destroyer and opened fire with all guns at point-blank range, the enemy not being seen again. At 11.30 p.m. the Fourth Flotilla under Captain Wintour in the Tipperary attacked enemy cruisers, and in the ensuing fight the Tipperary was sunk by gun-fire, and the Broke, becoming unmanageable, rammed the Sparrowhawk, which had to be sunk later. The remainder of this flotilla gained touch about midnight with the enemy's Second Battle Squadron, and a gallant attack resulted in the sinking of the Pommern and probable damage to other battleships, although the Fortune and Ardent were lost on the British side.

The Twelfth Flotilla under Captain A. J. B. Stirling also did good work, sighting an enemy battle squadron of six ships at 1.45 a.m. and attacking them at a range of 3000 yards, a violent explosion being seen in the third ship of the line. Similar in gallantry was the attack of the Moresby, of the Thirteenth Flotilla, on four battleships

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of the Deutschland class at 2.35 a.m., an explosion being subsequently heard. It is an illustration of the amount of good work performed by the British destroyers that, besides the German battleship Pommern, which was sunk by this means, four other enemy battleships were torpedoed, including the Markgraf and Grosser Kurfürst. Among the battle cruisers, the Lützow was torpedoed twice and the Seydlitz once; while all four of the light cruisers which were sunk were hit by torpedoes. The proximity to their ports enabled the Germans to save vessels which would otherwise have foundered.

Enemy losses.

Official information issued on February 22, 1919, gave the number of casualties inflicted on the German *personnel* at Jutland at about 3076. Only one ship of the Dreadnought type, the battle-cruiser Lützow, was sunk. This ship received forty direct hits and was torpedoed twice, being ultimately abandoned. The pre-Dreadnought battleship Pommern was sunk by torpedo. The battle-cruiser Seydlitz was disabled and taken in tow; twenty-eight shells and one torpedo struck her, and she was beached in a sinking condition. The battleship König received fifteen hits, and had sixty-five killed in her crew, but was able to return to port. Four light cruisers, the Elbing, Rostock, Wiesbaden, and Frauenlob, were sunk and six others damaged. Five destroyers, the V 4, V 27, V 29, S 35, and V 48, were sunk and several others damaged. Had not the Germans been within 100 miles of their base at Heligoland on the conclusion of the action, their chances of getting damaged units home would have been appreciably less. An honours list for the Jutland Battle was published in the *London Gazette* on September 15, 1916, in which three V.C.s were awarded.

Result of the battle.

The result of the Jutland Battle was claimed as a victory by the Kaiser and throughout Germany. An official Berlin telegram on June 7, 1916, declared that "the German victory was gained by able leadership and by the effect of our artillery and torpedoes." As Mr. Balfour, then First Lord, pointed out on August 4, 1916, it would be an error to suppose that the engagement changed the naval situation. What it did was to confirm it. Before Jutland, as after it, the German Fleet was imprisoned. After the armistice was proclaimed on November 11, 1918, however, Captain L. Persius wrote in the *Berliner Tageblatt* that Germany narrowly escaped a crushing naval defeat at Jutland, sustaining severe losses, and it was clear to all acquainted with the situation that this battle would be the only one. The crews realised "that if battle were given it meant, having regard to the small number of ships available, the useless sacrifice of a large number of valuable lives."

The naval strategy of the enemy Powers after the Battle of Jutland

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consisted in a policy of (1) attrition, to wear down the naval and mercantile resources of the Allies; and (2) frightfulness, to disturb public opinion and weaken the people's *morale*. As before, surface vessels, submarines and mines, and aircraft were all employed for this dual purpose. Following on the raid on the night of February 10, 1916, when the sloop Arabis was sunk off the Dogger Bank, the German Battle-Cruiser Squadron on the morning of April 25, 1916, appeared off Lowestoft and Great Yarmouth and bombarded those places for twenty minutes. This raid was timed to coincide with the rising in Ireland, in suppressing which the Navy assisted by capturing a German auxiliary trying to land arms. The only occasion after the Battle of Jutland when the German Fleet came out of its ports was on August 19, 1916. Learning from its air scouts that the British were in considerable strength, the enemy fleet returned in order to avoid engagement. Submarine E 23, Lieut.-Commander R. R. Turner, made a successful torpedo attack upon the Westfalen on this occasion; while in searching for the enemy the light cruisers Nottingham and Falmouth were lost on the British side.

Small craft engagements.

Pursuing the war of attrition, the Germans made raids of increasing frequency during this period from the Belgian ports, where their forces received accessions of strength by new units being completed. Sir John Jellicoe, in August, 1917, declared that the Germans had applied to this length of sand-fringed coast the same principle of intensive fortification adopted higher up the North Sea at Heligoland. The coast-line was studded with heavy guns, constituting infinitesimal targets at long ranges, and the enemy had not been slow to make the fullest use of smoke screens and aircraft for protection. So frequent did the small craft affairs become that the Admiralty ceased to publish details except in cases of special importance. On May 16, 1916, British destroyers and monitors came into conflict with German destroyers, and after a short engagement the enemy withdrew; our own vessels sustained no casualties. On July 22nd, a similar affair occurred at night, near the North Hinder light-vessel, three destroyers being sighted and fired upon. Later, six destroyers were met, and in a running fight were repeatedly hit, but managed to reach the Belgian coast. While the British forces at Harwich were thus always on the alert, the Dover Patrol, under Sir Reginald Bacon, was fully occupied in guarding the Straits and protecting merchant shipping. In the six months up to May 29, 1916, the Vice-Admiral reported that over 21,000 merchant ships, besides men-of-war and auxiliaries, passed through the Dover Patrol, of which only twenty-one, or less than one per thousand, were lost.

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The enemy at Zeebrugge.

A new phase of the sallies from Zeebrugge was indicated by the capture on June 24, 1916, of the Great Eastern Railway Company's steamer Brussels, Captain Fryatt, with its deplorable sequel in the execution of this gallant ship-master. The Lestris, of the Cork Steamship Co., was similarly captured on July 5th, the Colchester on September 21st, and the Oldambt on November 1st, but the last-named was recaptured by British light forces. Such captures were magnified in Germany to support the belief that the Battle Fleet was actively engaged at sea. The Lestris was said to have been "taken as a prize not far from the English coast by part of our High Sea Forces." The Belgian coast was also utilised to the full for the provision of bases for the aircraft employed in raids on England. In meeting these attacks, British naval aircraft performed most valuable service, and there was substantial, if slow, improvement in their methods of attack and defence. With naval airmen's co-operation, four Zeppelins were brought down in England in 1916, and others at sea, while several more were damaged.

British losses in 1916.

In the higher parts of the North Sea, the naval operations included submarine and mining tactics on the part of the enemy, but with little effect. On June 5, 1916, the cruiser Hampshire was mined off the Orkneys with serious loss of life, including Lord Kitchener and his Staff. Other mining losses were confined to destroyers and auxiliary craft. It was significant of the efficient protection to the ships of the Fleet that in 1916–17–18 the only losses from mine or submarine sustained by battleships or cruisers of all classes were seven in number, excluding the Nottingham and Falmouth, sunk in a Fleet operation as already stated. The battleships Cornwallis and Russell were lost in the Mediterranean, and the five victims in Home waters were the King Edward VII., Hampshire, Drake, Ariadne, and Arethusa. It will be seen that these were principally older units, and included no Dreadnoughts. Mention may be made of the destroyer Lassoo, torpedoed on August 13, 1916; the sloop Genista, torpedoed on October 23, 1916; and the armed trawlers Onward, Era, and Nellie Nutton, torpedoed or otherwise destroyed by submarines on July 11, 1916. These victims of the war of attrition were typical of others. The torpedoing of the armed boarding-steamer Duke of Albany on August 24, 1916, also came as a reminder of the continuous and arduous work of the Blockade Squadron. That our own submarines were ever ready at a favourable moment was shown by the torpedoing of the German cruiser München on October 19, 1916; and of two German battleships of the Kaiser class on November 5, 1916.

The submarine war on merchantmen continued during 1916,

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marked with outbursts of activity and every possible form of outrage. The attack on the cross-Channel steamer Sussex on March 24th, when 100 lives were lost, was followed by the lying communication suggesting that this vessel was mistaken for a mine-sweeper of the Arabis type. On May 11, 1916, an official list showed that thirty-seven unarmed merchantmen were torpedoed without warning from May 7, 1915, when the Lusitania was sunk, to May 10, 1916, when the Cymric was torpedoed. The latter was attacked 138 miles from the Irish coast, but remained afloat long enough for the people on board to be saved. By October the U-boat had reached America, six vessels being sunk off the Nantucket lightship by U-53, Commander Hans Roze. A new venture was the despatch of a commercial submarine to the United States—the Deutschland arriving from Bremen on July 9, 1916, and October 31, 1916. These two voyages were not repeated. Deplorable incidents connected with the submarine war were unfortunately numerous, but the following are typical. On October 17, 1916, the Furness-Withy liner Rappahannock left England for Halifax. Nothing more was ever heard of her. She was evidently a victim of the policy of *spurlos versenkt*, exposed by the publication of a telegram from Count Luxburg, German Chargé d'Affaires in Buenos Ayres, in May, 1917, suggesting that the small steamers Oran and Gauza, then nearing Bordeaux, should be "spared if possible, or else sunk without a trace being left." On December 14, 1916, the British steamer Westminster was attacked 180 miles from the nearest land and sunk in four minutes. The submarine then shelled the survivors in open boats, one of which was sunk, the master and chief engineer being murdered. On November 9, 1916, the German wireless reported that the steamer North Wales had been torpedoed. Beyond bodies and wreckage cast ashore in Cornwall, nothing else was known concerning the fate of this vessel. Two other outrages, although occurring in a later period yet to be dealt with, may be recorded here. On March 19, 1917, the Alnwick Castle was torpedoed 320 miles from the nearest land. One of her boats reached Corunna after terrible privations, eight of the twenty-nine people originally in it having died. The rest were all suffering severely from exposure. On July 31, 1917, the Belgian Prince was torpedoed and her crew cast adrift in two boats. Ordered to come on board the submarine, the master was taken prisoner to the interior of the boat and the other seamen assembled on deck. Their two boats were smashed with axes. The hatch was then closed, and the boat submerged with the forty-three men still standing there. Only three were picked up, these having contrived to retain their lifebelts without the knowledge of the Germans.

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Dover Straits raid.

The increasing drain of the submarine war at length affected the political situation at home, as did also the course of events in the North Sea. Considerable public stir was caused by the announcement that, for the first time since war began, the Germans, on the night of October 26, 1916, had raided the cross-Channel transport service with ten destroyers under Commodore Michelsen. The destroyers Flirt and Nubian were disabled (the former being sunk) and six drifters destroyed. One portion of the Nubian was salved, and later built into the surviving portion of the Zulu, a sister destroyer, the combined hull being renamed the Zubian. The empty transport Queen was sunk in the raid, which was made on a very dark night. The enemy went as far west as Folkestone. Mr. Balfour pointed out that not the smallest military damage to our lines of communication was caused, and he expressed the "confident hope" that if the Germans came again "they will not be able to get out of the Channel again without heavy disaster." However, on November 23rd, or a month afterwards, six German destroyers made another attempt to approach the north end of the Downs. They damaged a drifter, and returned without being intercepted. The claim to have shelled Ramsgate was denied. In the same week, on November 26th, there were German destroyers off the Norfolk coast, the armed trawler Narval being sunk and her crew captured. To allay the growing uneasiness, Admiral Sir John Jellicoe was recalled from the Grand Fleet to become First Sea Lord at the end of November, 1916. He brought with him Admiral Sir Cecil Burney, Commodore Lionel Halsey, and other officers with fighting experience at sea in the war. Admiral Sir David Beatty assumed command of the Grand Fleet. Almost before these changes had taken effect the Coalition Government of Mr. Asquith had resigned, and, in the place of Mr. Balfour as First Lord, Mr. Lloyd George appointed Sir Edward Carson.

Admiralty changes.

The first task of the new Board was to take stronger steps to check the submarine menace. On January 11, 1917, speaking at Fishmongers' Hall, Sir John Jellicoe said this menace to the Merchant Service was far greater than at any period of the war, and it required all our energy to combat it. In his book, published in February, 1919, Lord Jellicoe shows that, for eighteen months before he was asked by Mr. Balfour to become First Sea Lord, he had written to the Admiralty urging that action should be taken to deal with the ever-growing submarine menace. "It had been for some time my opinion," he says, "that unless the Navy could devise effective means, first, to destroy the submarine, and, secondly, to protect our communications more successfully until the submarines could be

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destroyed, there was undoubted risk of our being forced into making an unsatisfactory peace." At the end of January, 1917, the Germans launched what they called "unrestricted submarine war." The United States Government was notified on the 31st that the German Navy "must abandon the limitations which it has hitherto imposed on itself in the employment of its fighting weapons at sea," and wide zones around Britain, France, Italy, and in the Eastern Mediterranean were declared blockaded areas, in which all traffic, including that of hospital ships, would be prevented. The hospital-ship threat was carried out in the cases of the Asturias, Gloucester Castle, Salta, Donegal, Lanfranc, Dover Castle, and other vessels. By way of reprisal for the first of these violations of Article 10 of the Hague Convention, a large squadron of British and French aeroplanes bombarded Freiburg on April 14, 1917. Possessing over 200 submarines, the Germans made a determined and diabolical onslaught upon the merchant shipping of all nations. British losses increased up to April, 1917, when the campaign was at the height of its virulence.

Counter measures.

The counter measures taken against submarines, and the success of the convoy system in diminishing losses, are described in later chapters. We have only attempted to give here indications of the general progress of the submarine war from the British standpoint. Revelations made after the armistice showed that in Germany—although the Kaiser, as recently as September 25, 1918, expressed his conviction that this weapon would turn the war in German favour—the public confidence in the efficacy of the policy had considerably declined. Captain Persius declared that "the celebrated orgies under Tirpitz and Capelle were bluff," and that after September, 1917, material for the construction of submarines was so scarce that ships of the line had to be withdrawn from service.

Entrance of the United States Navy.

One of the most important results of Germany's decision to conduct unrestricted submarine war on neutrals as well as belligerent ships was the entry of the United States into the conflict. On receiving the German Note, the American Cabinet met, and on February 3, 1917, President Wilson declared in a speech to Congress that the United States had no alternative consistent with dignity and honour but to sever all diplomatic relations with Berlin. Precautionary measures were taken in the Atlantic Fleet, then at Cuba under Admiral H. T. Mayo, in the other sea-going forces, and at the dockyards. American merchantmen remained in port pending a government decision on the question of armament against submarines, but on February 5th, Mr. Lansing advised that shipowners might take the necessary measures to prevent or resist attack, and

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sanction for carrying arms was embodied in the Armed Neutrality Bill.

On April 2nd, President Wilson asked Congress to recognise a state of war with Germany. The Senate, on April 4th, by eighty-two votes to six, and the House, on April 6th, by 373 votes to fifty, adopted a declaration of war, and on April 6th the President signed the resolution giving effect to this. On April 12th it was announced that Admiral W. S. Sims was in England as head of an American naval mission to arrange details for the co-operation of the United States Navy, and next day there was a conference at Washington between Mr. Daniels, U.S. Naval Secretary, Rear-Admiral W. S. Benson, U.S.N., Rear-Admiral M. E. Browning and Rear-Admiral Grasset, of the British and French Navies respectively.

American participation in hostilities.

What was described as America's first act of war was the despatch, on April 13th, of warships to take part in patrol work in the Western Atlantic, using British and French bases in the West Indies. From May 4th, United States war vessels were operating with the Allied naval forces in European waters, having left American ports towards the end of April. They were under the command of Vice-Admiral Sims, who had preceded them to Europe, and who was in daily touch with the British Chief of the Naval Staff in London. In a signal of welcome to the American destroyers, Admiral Beatty said: "The Grand Fleet rejoices that the Atlantic Fleet will now share the task of preserving the liberties of the world and maintaining the chivalry of the sea." A French official announcement, on June 6th, stated that American warships had arrived off the French coast. During June, in the absence of Vice-Admiral Sir Lewis Bayly from Queenstown, Vice-Admiral Sims temporarily took over the Irish Naval Command.

Sixth (American) Battle Squadron at Rosyth.

The part played by the United States Navy in the war is described in a later chapter, but mention must be made here of the American Battle Squadron, under the command of Rear-Admiral Rodman, which arrived in British waters in December, 1917, to co-operate with the Grand Fleet. This force, instead of acting as an independent unit, was embodied, by the wish of the Admiral in command, in the Fleet as the Sixth Battle Squadron. The battleships adopted all British signals and British methods of tactics, and made themselves as nearly as possible actual units of the Grand Fleet. The relations established between the two navies were most cordial, and when on December 1, 1918, the Sixth Squadron ceased to form part of the Grand Fleet, Admiral Sir David Beatty proceeded on board the flagship New York and delivered a speech of thanks to the American officers and men for their wonderful co-operation and

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loyalty in every duty they had to undertake. "The support which they had shown was that of true comradeship," said the Commander-in-Chief, "and in the time of stress was worth a very great deal." The squadron, comprising the New York, Utah, Oklahoma, Arizona, Wyoming, Florida, Arkansas, Texas, and Nevada, proceeded to Portland to give leave, and then put to sea to welcome President Wilson on his visit to France and England. On December 25th they arrived at New York and were reviewed by Secretary Daniels. Some of the smaller U.S. warships had returned home previously. A flotilla of thirty submarine chasers, with a number of submarines and their parent ship Bucknell, left Queenstown on November 25th. The anti-submarine base at Plymouth began to be disbanded on February 14, 1919, when a number of chasers left to join the American warships at Brest and Inverness. It was finally closed on March 5th.

Counter measures to submarines.

Attention must now be drawn to certain of the leading incidents in the war against the submarine. A great obstacle to the prosecution of effective counter-measures when the unrestricted U-boat war began in February, 1917, was the lack of suitable material. Speaking on March 8, 1917, Sir Edward Carson said that, in all the theatres of war the world over, the Navy had to provide patrols, convoys, mine-sweepers, mine-layers, air service, mine-carriers, fleet messengers, and so on. "Recollect," he said, "if you criticise us for not doing enough, so far as I am concerned, and so far as the Admiralty are concerned at the moment, we have to fight with the weapons which are there, because you cannot improvise ships as you would a gun or a rifle." How inadequate were the means at the disposal of the sea commanders was shown by the following admission of Sir Eric Geddes on July 30, 1918:—"A year ago we were faced with a situation which up to that time was considered by many almost inconceivable and insoluble. Our available Mercantile Marine power was being sunk at a rate which would soon have brought us to the point of inability to continue the war, and we were without tried and recognised means of combating it."

Convoy system applied.

One of the steps taken to meet the situation was the organisation of a convoy system for merchant shipping, similar in principle to that which had been followed from the beginning of the war for the transport of troops, stores, etc.

The trade route between Great Britain and Scandinavia was one to which the system was applied, and, as was to be expected, the presence of shipping convoys on this route soon attracted the attention of the enemy. On October 17, 1917, two German cruisers fell upon a convoy under the escort of the destroyers Mary Rose

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Scandinavian convoy attacked.

and Strongbow, sank the latter after a brief engagement, and then destroyed nine of the merchantmen. A second mishap of the kind took place on December 12th, when six ships, totalling 8000 tons, with the destroyers Partridge and Pellew and four armed trawlers as anti-submarine escort, were attacked by four German destroyers. The Partridge was sunk and the Pellew disabled, when the Germans turned their attention to the rest of the convoy and destroyed every vessel. Deplorable as were these incidents, it was impossible, as Sir Eric Geddes pointed out on October 23, 1917, to prevent such occasional raids by fast surface craft.

Developing the convoy system as quickly as material permitted, Sir Eric Geddes was able to state on March 5, 1918, that 35,000 ships had been convoyed, with satisfactory results. The difficulties in handling such a heterogeneous collection of ships, especially in face of a possible sudden attack, are obvious, and the success achieved constituted a high tribute to the skill of the seamen concerned, both naval and mercantile. Admiral Sims, U.S.N., in a speech on March 7, 1919, said that the success of the convoy system "was due in great measure to the adaptability of the British seamen in learning to manœuvre in close formation—a thing to which they had never been accustomed."

The decoy ships.

The efforts made in the construction of anti-submarine craft of new types are referred to elsewhere in the *Naval Annual*, but brief mention may be made in this chapter of the adaptation of existing ships and of the introduction of new appliances for their use. On August 4, 1918, Sir Eric Geddes revealed to the public the work of the Q boats, and told the story of the thrilling encounter of one of them. These decoy ships came into use in the summer of 1915, and according to Lord Jellicoe the first submarine destroyed by them was sunk by the Prince Charles, Lieutenant W. P. Mark-Wardlaw, working from Scapa Flow, on July 25, 1915.

Depth charges.

Depth charges were a means of inflicting damage or loss upon a large number of enemy submarines. The Commander-in-Chief of the Grand Fleet recommended the provision of a depth charge defence in 1914, and the matter was taken up in the Vernon Torpedo School. Ultimately, the Submarine Attack Committee of the Admiralty recommended the adoption of a design which was practically that used throughout the war. The British Navy not only led the way in the development of this weapon, but in the fitting out of special vessels for its intensive employment. In addition, a "thrower" and other devices in connection with mines were invented in Great Britain. Illustrating the value of depth charges, the

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following official narrative was issued with others relating to the anti-submarine war on September 30, 1917 :—

"A torpedo boat, on patrol in the Atlantic, observed a steamer torpedoed by a submarine. She proceeded to her assistance, and shortly afterwards the steamer sank. Having picked up the survivors, the torpedo-boat circled round searching for the submarine, and shortly afterwards a white patch in the water was sighted right ahead. The torpedo-boat made straight for the spot, actually grazing over the submarine. The first depth charge was dropped as she passed over the boat, and, turning round with all speed, a second and third charge were also detonated in the place where oil and air-bubbles were coming to the surface. At once the air was heavy with the smell of gasoline, while subsequent investigation by sweepers confirmed the presence of a heavy obstruction on the bottom."

Hydrophones.

Another appliance, equally valuable for defensive as well as offensive purposes, was the microphone or listening apparatus. It was officially revealed, at the Exhibition of Naval Photographs in London in July, 1918, that the British Navy was using microphones and hydrophones. A picture was shown of a bluejacket listening to the movements of a submerged U-boat, and it was stated that by means of this listening instrument many enemy submarines had been detected and finally destroyed.

Aircraft operations.

Aircraft operations against the U-boats were very numerous and varied. An authoritative statement issued for publication on December 16, 1918, showed that there were two kinds of anti-submarine patrol, intensive and extensive. The intensive kind was concerned with spotting and escorting in the war channel—a defined area within which all convoys kept, and which was frequented by submarines in search of their prey. Aircraft on these patrols were under the S.N.O. of the Group to which the squadrons were attached, and the machines were used in conjunction with the surface craft and the hydrophone stations. Figures given showed that the number of hours flown by the R.A.F. anti-submarine patrol from April 1st to October 31, 1918, was 39,102, and in this period 216 hostile submarines were sighted and 189 attacked.

The Auxiliary Patrol.

The Auxiliary Patrol, of course, took a large part in fighting the submarine. Speaking on July 11, 1918, Sir Eric Geddes described a typical fight between a submarine and some trawlers under a lieutenant of the R.N.V.R., and said that it was by means of hunting craft provided with depth charges and other weapons that the submarine had been turned from the hunter to the hunted. He referred to a case in which a U-boat off a certain seaside resort was

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hunted for 72 hours, and had thirty-five depth charges dropped around her. In the end she came up alongside a drifter and the crew surrendered. In a message to the Auxiliary Patrol before its dispersal at the beginning of January, 1919, the Admiralty said: "When ships were mined, torpedoed, or wrecked, the Auxiliary Patrol vessels have been untiring in their efforts to rescue the crews, and their seamanship, pluck, and determination have resulted in the salving of many badly-damaged ships. On the appearance or report of an enemy submarine, it fell to the Auxiliary Patrol to hunt her by every available method, some of these involving the correct use of highly technical apparatus, which the crews learnt to handle with the greatest efficiency."

Self-defence of merchantmen.

The encouragement given to the Merchant Service to defend itself not only included the provision of guns and crews, but also the supply of "Otter" protection gear, the introduction of "dazzle-painting" for disguising vessels, and the use of smoke-boxes for making smoke-screens. Other inventions might be cited of a similar kind. Sir Alfred Yarrow placed at the disposal of the Allies in 1918 his anti-submarine smoke system, the object of which was to prevent the smoke of ships going up into the air and giving away the vessel's position long before she would otherwise be seen. By emitting the smoke through the sides of the ship, the danger area was reduced to about one-third. Sir Alfred Yarrow also improved the efficiency of the look-out in merchant vessels by awarding monetary prizes to the first person who should sight a U-boat. As Sir Eric Geddes showed on November 1, 1917, if a submarine was sighted by the look-out in a vessel it was seven to three in favour of her getting away, but when the submarine was not sighted it was four to one in favour of the U-boat sinking the ship. Hence the vital importance of maintaining the best possible look-out system.

Destroyer action off Dutch coast.

Turning now to the general progress of the sea war in 1917–18, apart from the submarine campaign, one of the first encounters reported after Sir Edward Carson and Lord Jellicoe came to the Admiralty was the destroyer action off the Dutch coast on the night of January 22, 1917. In very severe weather, a German destroyer flotilla was engaged by British light forces in the vicinity of the Schouwen Bank, and the enemy flagship, V 69, was badly damaged and assisted to Ymuiden by a Dutch tug. Corvette-Captain Schultz, commanding the flotilla, was killed in the V 69 in addition to other officers and men. Other German destroyers suffered considerable punishment, and on the British side a destroyer was torpedoed and subsequently sunk. V 69, after repairs to make her seaworthy, left Ymuiden on February 11, 1917, for German waters.

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On the night of January 25th, German torpedo craft illuminated Southwold by star-shells and bombarded the place for a few minutes, causing only insignificant damage and no loss of life. A somewhat similar episode as regards its futility was the bombardment by a German submarine of Bayonne on February 12th, when five persons were wounded.

Raids on South-east coast.

Continuing their "tip-and-run" raids, the German destroyers on the night of February 25th approached the Kentish coast and fired into Broadstairs and Margate. Again, very early on the morning of March 18th, enemy destroyers raided the coast and shelled certain points on the coast at Ramsgate. On this occasion a British destroyer was sunk and another torpedoed whilst rescuing survivors. About 2 o'clock in the morning of March 26th, the German torpedo craft fired about sixty shells into Dunkirk; and on the night of March 28th they were again active off Lowestoft, sinking the armed trawler Mascot. Coupled with the annoyance caused by air raids, the frequency of destroyer attacks on the south-east coast led to a deputation from Ramsgate, Margate, and Broadstairs appearing before the Admiralty on April 5, 1917. Sir Edward Carson assured the deputation that certain alarmist rumours current in the district had no foundation in fact, and that the position was not more serious than it had been since the beginning of the war.

Broke and Swift action.

A few days later a timely check was given to the enemy activities in a spirited action in the Dover Straits. On the night of April 20th five German destroyers attempted to raid Dover, without success, and then steered in the direction of some shipping. They were met by the destroyer leaders Broke, Commander E. R. G. R. Evans, and Swift, Commander A. M. Peck, who engaged and sank at least two, and possibly three, of the enemy boats, the remainder escaping at high speed. The boats destroyed were G 85 and G 42. The British vessels, said the official report, were handled with remarkable gallantry and dash, and the tactics pursued were a very fine example of destroyer work. Ten German officers and 108 men were rescued. The two destroyer commanders were promoted and awarded the D.S.O. A feature of the affair was the ramming of one of the German destroyers by the Broke, when a hand-to-hand fight ensued while the ships were locked together. Headed by Midshipman D. A. Gyles, R.N.R., the men of the Broke cleared their deck of the Germans who managed to scramble on board.

Soon after the foregoing episode the Germans ceased to carry out raids on the British coast. The British counter-measures appeared to partake more of an offensive character in every direction, and

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fewer opportunities were presented to the enemy for taking the initiative. While the unrestricted submarine warfare was at its height, the British Admiralty had naturally to give the mercantile fleet a measure of protection out of all proportion to that which would have been necessary in normal circumstances, and in doing so our own blockading efforts had to suffer and the "tip-and-run" raids had more scope. As Lord Jellicoe pointed out in an interview on April 12, 1917, the Germans had the great advantage of choosing the time of attack, and when as many as thirty destroyers could attack one patrol line, some idea of the number of vessels needed to be on guard constantly to stop every raid can be imagined. The R.N.A.S. machines working in conjunction with the Dover Patrol had, however, frequently bombed the German bases along the Belgian coast during the early months of 1917, and although this had a harassing effect upon the enemy *personnel*, and caused a certain amount of material damage, it did not suffice to stop raiding.

The Dover Patrol acts offensively.

The first sign of more aggressive measures was contained in the announcement that on the night of April 7th, in conjunction with seaplane attacks on the mole, and on ammunition dumps near Ghent and Bruges, "other operations were carried out off Zeebrugge during the same night, as the result of which two enemy destroyers were torpedoed. One of these was seen to sink; the fate of the second is not certain, but she was very severely damaged." The boat destroyed was G 88.

At least twice during May enemy craft which emerged from the Belgian coast were sighted and engaged. On the 10th, light cruisers and destroyers, under Commodore Tyrwhitt, sighted eleven German destroyers, which immediately retired at full speed under cover of smoke screens; and on the night of the 19th, a flotilla got as far as Dunkirk, there to be encountered by four French destroyers, when the enemy withdrew after a short engagement.

The Harwich force in action.

Resuming the offensive in June, Ostend was heavily bombarded by units of the Dover patrol on the 5th, and a photographic reconnaissance over the town next day showed that the majority of the workshops had been destroyed. A force from Harwich, patrolling off the coast during the bombardment, intercepted six enemy destroyers, of which S 20 was sunk and another severely damaged. On June 10th, the Vice-Admiral at Dover reported that all large shipping had been removed from Ostend, the harbour presenting a deserted appearance.

Higher up in the North Sea there was an extension of mine-laying by the British Navy, the usual notices being issued to mariners of all countries. This step was taken "in view of the

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unrestricted warfare carried on by Germany at sea by means of mines and submarines, not only against the Allied Powers, but also against neutral shipping, and the fact that merchant ships are constantly sunk without regard to the ultimate safety of their crew."

Loss of Vanguard.

A few losses to small craft of the Fleet were caused by floating mines and enemy submarines. On July 30, 1917, the cruiser Ariadne was torpedoed and sunk, her crew being saved, except thirty-eight, killed by the explosion. More serious was the disaster to the battleship Vanguard, on July 9th, the vessel blowing up whilst at anchor at Scapa Flow, as the result of an internal explosion. Only two men of the total on board at the time survived.

Another affair in the Heligoland Bight occurred on August 16, 1917, when British light forces sighted an enemy destroyer, which was engaged and repeatedly hit, but escaped through the mist over a mine-field. Some mine-sweepers were sighted afterwards, and fired upon, at least two being severely damaged. Two submarine attacks on the British vessels were frustrated, and no damage whatever was sustained by them. On August 21st, light forces operating off the Jutland coast destroyed an enemy Zeppelin—the third destroyed by the Navy during 1917—the others being the L 22 on May 14th, and L 43 on June 15th.

Affairs off the Danish coasts.

In this locality also, and to the west of Ringköbing Firth, British light forces on September 1st engaged and sank four enemy mine-sweeping vessels. The latter, on being attacked, made for the shelter of Danish territorial waters, and some of them ran aground on the Jutland coast, about 100 sailors reaching the shore on rafts or by swimming. The Danes complained later that the British forces, in pursuing the enemy, violated Danish neutrality, and the British Government expressed its regret, and offered indemnification for any damage which might have been caused.

The attack upon the Scandinavian convoy in October has already been referred to. A few days after the occurrence, on November 2nd, British forces were engaged in the Kattegat, where they destroyed a German auxiliary cruiser, the Maria Flensburg, a ship with 6-in. guns, which may well have been a potential raider like the Möwe. Ten armed patrol craft were also destroyed, and the affair indicated to what an extent the British advanced scouts and outposts had been pushed in towards the enemy's bases. Further evidence of this was the scrap in the Heligoland Bight, on November 17, 1917. According to the enemy report, it was "the first time since the early months of the war" that our forces had penetrated into the Bight. The British official account showed that shortly before 8 a.m., four

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enemy light cruisers were sighted on a northerly course, accompanied by destroyers and mine-sweeping or patrol vessels. The last-named made off, one being sunk by gun-fire from the British destroyers, which rescued survivors. The German cruisers and destroyers turned off towards Heligoland, and were pursued through the minefields, a running engagement being fought under a heavy smoke screen until four enemy battleships and battle-cruisers were sighted. Several hits were scored on the enemy before the action had to be broken off owing to the presence of the larger German ships and the proximity of Heligoland. About the same time, a force of British light battle-cruisers, including the Repulse, flagship of Rear-Admiral Sir R. F. Phillimore, appeared on the scene. No ships were lost on the British side, but the Calypso was struck by a shell which killed Captain H. L. Edwards on the bridge and caused other casualties. As the Admiralty pointed out, "owing to the presence of minefields it was necessary for our vessels to keep to the line taken by the enemy's ships, and consequently this area was too restricted for the supporting ships to manœuvre in. The enemy did not follow our vessels outside the the minefields."

Ostend bombarded.

Ships of the Dover Patrol carried out another bombardment of the naval works at Ostend on September 22, 1917, and photographs showed that one floating dock had sunk and heeled over, one work-shop in the dockyard had been completely demolished, and seven others damaged, and a portion of one submarine shelter was missing. Apart from the vigorous air operations in this portion of the North Sea, the only other special feature before the end of 1917 was the employment by the Germans of an electric boat. On November 3rd an attack was made on our vessels patrolling the coast by an electrically-controlled boat of high speed, but the attack was defeated and the boat destroyed. It was understood that the ship attacked was the Erebus, which was only slightly damaged, the effect of the explosion being mainly absorbed by the under-water bulge protection which is a feature of this class of monitor. Further details issued on Nov. 12th showed that these boats were twin petrol-engined vessels, partially closed in, and travelled at a high speed. They carried a drum with between 30 and 50 miles of insulated single-core cable, through which the boat was controlled electrically. The fore-part carried high explosive, probably from 300-500 lb. The method of operating was for the crew to start the engine and then leave. A seaplane accompanied the vessel and signalled to the shore operator the helm to be given to it. The intention was that, on being steered into a ship, the charge would explode automatically. As the Admiralty pointed out, the device was an old one, and had been

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A 77. A boat with survivors reached the Jutland coast after nearly four days at sea.

Botha and Morris action.

Early on the morning of March 21st—the day of the opening of the German offensive on the Western front—a force of enemy destroyers bombarded Dunkirk for ten minutes. They were afterwards engaged by two British and three French destroyers, with the result that two enemy destroyers and two torpedo-boats were believed to have been sunk, and survivors were picked up from the torpedo-boats. The Germans only admitted the loss of two outpost vessels. No Allied vessels were lost, but a British destroyer was damaged. Later information showed that about eighteen enemy craft took part in the raid, organised in three groups, which were to bombard respectively Dunkirk, La Panne, and Bray Dunes. The British destroyers Botha, Commander R. L. M. Rede, and Morris, Lieut.-Commander P. R. P. Percival, were on patrol with the French destroyers Mehl, Magon, and Bouclier, and on hearing gunfire made for the flashes. Star shells were fired to light up the enemy, which was the means of stopping the bombardment; and in attempting to run away the Germans were challenged by the Allied force. The Morris cut off a large German destroyer, and torpedoed and sank her at 500 yards range. Meanwhile, the main steampipe of the Botha was severed by a stray shell, causing her to lose speed, and her commander, firing both torpedoes, made for the fourth boat in the German line and rammed her, cutting her completely in two. Swinging round again, the Botha endeavoured to repeat the coup on the next astern, but the latter managed to elude her, and fell a victim to the torpedoes and guns of the French destroyers. Aided by smoke-screens and mist, the rest of the German flotilla escaped, but before reaching their base a squadron of R.N.A.S. machines on patrol dropped a shower of bombs on them, throwing them into disorder. Yet a further stroke was delivered against them as they reached the mole, for a coastal motor-boat, travelling at great speed in a cloud of spray, launched a torpedo which struck the stern of one of the German destroyers. This successful resistance to, and retaliation upon, the German raiders on March 21st not only avenged the drifters lost on February 15th, but had a salutary effect upon the enemy's policy. No more "tip-and-run" raids were reported, and from this time onwards the initiative definitely passed into the hands of the Allies in this part of the North Sea.

An indication of the kind of work carried out by the destroyer flotillas in the enemy's waters was revealed by an episode on March 28, 1918. On this day the British destroyers Abdiel, Legion, Telemachus, Vanquisher, Ariel, and Ferret, under the command of

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Exploit of Abdiel and other t.b.ds.

Captain Berwick Curtis, of the Abdiel, were engaged in a sweep of the Heligoland Bight when they encountered three German armed outpost trawlers, the Scharbeutz, Mars, and Polarstern, each of which had a gun, bombs, depth charges, and searchlights. It was night time and misty weather when the trio were discovered, all lying at anchor in line. Two destroyers were detailed to board each of the trawlers, and owing to the heavy sea prevailing this was a matter of some difficulty. The Germans were quite taken by surprise, and apparently had no idea of opening fire in their own defence. As two destroyers approached the centre trawler her crew abandoned their vessel, which blew up immediately afterwards as the result of bombs on board exploding. Owing to the rough sea the boarding party for another trawler were unable to get to her, and the captain was therefore ordered to weigh anchor and steer a certain course, which he promptly did. As the weather got worse, however, it was decided to make another attempt to take off the Germans, which was done successfully by boats' crews. The trawlers were then sunk, one with a demolition charge and the other with a few rounds of gunfire. There were altogether seventy-two officers and men taken prisoners.

Closing the Belgian ports.

The desirability of blocking the harbours at Ostend and Zeebrugge by the sinking of ships across the entrances or channels had been apparent ever since the early days of the German occupation in 1914; but although the project was considered feasible in the Grand Fleet, and Admiral Jellicoe suggested it to the Admiralty, no action was taken until after he became First Sea Lord. Directions were then given to the Plans Division of the Naval War Staff to prepare plans for blocking Zeebrugge. An independent proposal by Sir Reginald Bacon for attacking the Mole by landing parties from monitors run alongside it was also adopted and embodied in the general scheme, which was finally approved by Admiral Jellicoe in November, 1917. On January 12, 1918, it was officially announced that Sir Reginald Bacon had been appointed Controller of the Munitions Inventions Department. He was succeeded in command of the Dover Patrol by Rear-Admiral Roger Keyes, formerly head of the Plans Division of the Naval Staff, who was given the acting rank of Vice-Admiral, to date January 1st. This officer, under whose immediate direction the project had been prepared, was thus selected to be responsible for its execution, and the date of the enterprise was fixed for April 23rd.* The Grand Fleet, the main naval depôts, and various forces, such as the Dover Patrol, were invited to send a certain number of suitable men to take part. These men, all volunteers, were carefully instructed as to their duties in the difficult and delicate operations. Six old

* For the official despatches see Part IV.

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cruisers were specially selected and prepared. The Vindictive, Captain A. F. B. Carpenter, assisted by the ferry steamers Iris and Daffodil, was detailed to be placed alongside the Mole with landing parties for demolition work to cause a diversion. The Thetis, Commander R. S. Sneyd; Intrepid, Lieutenant S. S. Bonham Carter; and Iphigenia, Lieutenant E. W. Billyard-Leake (who at the last moment replaced Lieutenant I. B. Franks, sent to hospital), were detailed as block-ships at Zeebrugge; and the Brilliant, Commander A. E. Godsal, and Sirius, Lieut.-Commander H. N. M. Hardy, as block-ships at Ostend. They were all stripped of everything except engines and armament, and besides being filled with concrete, had explosives to blow their hulls to pieces when they grounded. Three destroyers, in one of which, the Warwick, Vice-Admiral Keyes flew his flag, two submarines filled with explosives to blow up the viaduct, a flotilla of motor vessels and coastal motor-boats, and other units were also assigned certain duties, 168 vessels and craft of all kinds being employed, including a small French contingent from Dunkirk and reinforcements from the Harwich force under Sir Reginald Tyrwhitt. The *personnel* engaged consisted of eighty-two officers and 1698 men.

British attacks on Zeebrugge and Ostend.

On two occasions before St. George's Day the vessels had arrived off the coast, but had to return owing to impossible weather conditions suddenly arising. On the previous night, however, they were more fortunate. The craft with smoke-screens and the fast motor-boats rushed ahead at full speed, laid their screens, smoke-floats, etc., and so prepared the way for the main force. Monitors lying off the coast carried out a heavy bombardment in support. The respective forces for Ostend and Zeebrugge arrived there simultaneously, so that neither place could give warning to the other. Before midnight German star shells were lighting up the coast, and on emerging from the smoke-screen, the Vindictive saw the lighthouse at the end of the Mole about 400 yards away. Guns on the Mole opened fire on her almost immediately, and she replied with every gun which would bear. In splendid manner, assisted by the Daffodil, she was placed alongside, the landing brows run out, and the storming party disembarked, the men scrambling on to the Mole, in spite of the heavy swell and their being loaded with Lewis guns, bombs and accoutrements.

Within half-an-hour the block-ships were seen from the Vindictive rounding the lighthouse and heading for the canal entrance. A few minutes before, however, there was a great explosion at the shore end of the Mole, indicating that a submarine had got in between the piles of the viaduct and blown herself up. The crew got away in a motor

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skiff and were picked up, most of them wounded, by a steam pinnace. The first block-ship in, the Thetis, in breaking through the obstruction at the harbour mouth, fouled wires and nets, and signalled, therefore, to the Intrepid and Iphigenia to pass to starboard of her. She then grounded, her forecastle gun continuing to engage the nearest shore battery, and, after swinging her head towards the dredged channel of the canal, she quietly sank. The Intrepid and Iphigenia proceeded to the mouth of the channel and were sunk according to programme, the movement being facilitated by the enemy's attention being attracted to the Vindictive's party and the disabled Thetis.

Ostend. At Ostend, where the operations were conducted by Commodore Hubert Lynes, a change of wind interfered with the programme. The flares laid by motor launches were seen by the Germans and destroyed by gunfire, and the two cruisers failed to block the harbour completely, being sunk where they grounded. This proved to be outside the entrance, the absence of the flares putting the block-ships off their course. On May 9th, therefore, a second expedition was made to Ostend to complete the business, the Vindictive, filled with concrete, being sunk between the piers and across the entrance to the harbour. Commander Godsal, who in the first attempt commanded the Brilliant, took the Vindictive over on May 9th, and was killed in this second and more successful enterprise.

Only once after the blocking of Ostend and Zeebrugge was there a reported action between British and German small craft in this part of the North Sea. On the evening of June 27th, four British destroyers, patrolling off the Belgian coast, sighted eight enemy destroyers, which they engaged at long range. After a quarter of an hour's running fight, the enemy was joined by three more destroyers, whereupon the British force fell back on its supports. The Germans did not follow, and the action was thus broken off, the British having sustained no loss or damage.

Seaplanes at Tondern. In the next engagement reported from the North Sea it was again the British seamen who took the initiative. On July 19, 1918, a detachment of the Grand Fleet operating off the Jutland coast, and including the *ex* large light cruiser Furious as an aircraft carrier, launched an attack upon the Zeppelin sheds at Tondern, Schleswig. All the machines reached their objective, and made direct hits on a large double shed, which was completely destroyed, fire rising to 1000 feet. In the second flight all machines but one reached their objective. Four machines failed to return to the ships, and three of them landed in Denmark. According to information said to have been given in December, 1918, to the Allied Naval Commission by Captain Beuttler, of the German Zeppelin Service, three sheds and

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two Zeppelins were destroyed in the July raid. The German protecting squadron had been withdrawn, he said, as the landing was rough, and it was not thought that the Furious was so far advanced. He showed the Commission Zeppelin L 14, said to have been over England twenty-four times, and the only one of the older Zeppelins left.

Excellent work was done throughout the war by British submarines operating in the North Sea. Opportunities for action were comparatively few, but their usefulness and value was shown in other ways. Lord Jellicoe says in his book that a regular submarine patrol was begun off the Horn Reef in June, 1916, at first two, and later three, submarines being used for this duty, which was of great utility in giving information of the movements of few enemy surface vessels that ever ventured so far from their base. At the representation of Lord Jellicoe, the wireless equipment of the submarines attached to the Grand Fleet was increased to a radius of about 300–400 miles, instead of 50 miles. On June 19, 1916, submarine G 4, while patrolling the Kattegat, was sunk by gunfire outside territorial waters, the German steamer Ems rescuing the crew. Three days later, the first mines from a British submarine were laid by E 41 in the German Bight.

Submarine, patrol and mine-laying.

The concluding phase of hostilities in the North Sea was the work done by the Navy to support the military advance along the western front. At daybreak on September 28, 1918, when the Belgian Army attacked the German positions between Dixmude and the north of Ypres, British warships bombarded the coast defences of the enemy and vulnerable points of his communications. The guns of the Royal Marine Artillery in Flanders were also active in support. A Belgian *communiqué* on October 2nd stated that monitors were raining projectiles on the enemy's rear positions, devastating cantonments, sweeping his roads of communications, paralysing the movements of reserves and inflicting heavy losses on troops marching up to the front line even before they arrived there. By October 5th there were signs that the enemy was preparing to evacuate the coast sector, wharves being set on fire at Bruges, big guns removed from Knocke, and material for coast defences stored near the Noerbekehoorn Canal withdrawn and the sheds destroyed. The Flanders coast bases were no longer in use for sea operations, the vessels there having been withdrawn, and the aircraft had become fewer. In addition, the blocking of Ostend Harbour, begun by the Dover Patrol in April and May, was completed by the enemy. On the night of October 15th the Germans made their last bombardment of Dunkirk by long-range guns, two women being killed.

Monitor on Belgian coast.

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Re-occupation of Ostend.

Vice-Admiral Sir Roger Keyes landed at Ostend on October 17th, at 11.30 a.m. The military situation along the coast that morning was obscure, it being uncertain whether the enemy had retired or not. A division of destroyers, accompanied by aircraft, reconnoitred the coast, one of the aircraft landing on the beach at Ostend at 11 a.m., and immediately afterwards Sir Roger Keyes proceeded into the harbour in a whaler. The Germans were not entirely clear of the town, and a light battery at Le Coq opened fire at the ships, two shells falling among the crowd on the beach. To prevent further shelling, it was decided to withdraw the naval force, and the Admiral re-embarked, but four motor launches were left at Ostend as an inshore patrol to reassure the population, these craft being joined later by some French boats. The King and Queen of the Belgians proceeded in the destroyer Termagant to the vicinity of Ostend and, all being quiet, they landed and proceeded to the Hotel de Ville amid great enthusiasm, returning to Dunkirk about 10 p.m.

Although the armistice was not signed until twenty-five days later, the occasion of the landing at Ostend was the last on which the enemy exchanged shots with the British Navy in the North Sea. The last hostile act in this, the main theatre of the war, however, was the sinking of the mine-sweeper Ascot on November 10th. This paddle vessel was torpedoed by a German submarine off the north-east coast of England, and sunk with all hands, five officers (including two from the Mercantile Marine) and forty-seven men (including three Mercantile Marine ratings) losing their lives.

The Baltic.

Russian Fleet's duty.

The situation in the Baltic early in 1916, from one of disputed command when the war began, showed that the Allies had established control. The Russian Fleet under Admiral Kanin had been reinforced by several new ships, and a British submarine flotilla was present and doing good work. In an interview in March, 1916, Admiral Kanin said that the fundamental strategic picture was amply clear, the Russian Fleet being a continuation of the extreme flank of the Army, and its duty to support the Army's movements and protect it against envelopment by the German Fleet. In Riga Gulf in 1915, the German bid to secure the approaches to Petrograd had terminated in Russian favour, and with the confidence this success had engendered in the Russian seamen the outlook appeared to be a satisfactory one. Admiral Kanin himself said in June, 1916: "We are in a quite different position from that of a year ago. We are, to begin with, very much stronger in ships . . . In torpedo-boats

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and submarines we are now especially strong. Our mine-layers and mine-sweepers are numerous and devoted."

Incidents showing the efficiency and enterprise of the Russians in the Baltic occurred during the summer of 1916. As soon as the ice was cleared, the British and Russian submarines resumed their interference with the German traffic to Scandinavia, and this led to the latter proceeding more by night, and under escort. On the night of June 13, 1916, Russian torpedo-boats attacked such a convoy with good results, sinking a couple of torpedo-boats and the auxiliary cruiser Hermann, which carried 6-in. guns. Again, on June 30th, off Landsort, light Russian forces on patrol met a German torpedo flotilla and engaged it, but the result was indecisive. Two days later it was announced that Russian warships, including the Slava, had been bombarding the German lines in the vicinity of Riga, co-operating with the land artillery. Such bombardments were carried out intermittently whenever conditions were favourable, and it was evidence of the protection afforded to the bombarding ships that no serious loss occurred to them from torpedo attack; indeed, most inconvenience was caused by German aircraft. There was a good deal of cross-raiding in the air. Russian enterprise in 1916.

On October 13, 1916, Admiral Kanin was succeeded as Commander-in-Chief in the Baltic by Vice-Admiral Nepenin, formerly commanding the torpedo-craft division, and a month later, on November 10th, the Germans raided the Finland Gulf with some new destroyers and fired upon Baltic Port, to the west of Reval. They were intercepted when returning, however, and damage or loss inflicted on six or more enemy boats. There was no other naval action of special import in the Baltic prior to the Revolution. Admiral Kanin retires.

The part played by the Navy in the events of March, 1917, which led to the abdication of the Tsar, was only what might have been expected owing to the conditions prevailing. The ice prevented any really active work by the Baltic Fleet, and the battleships were confined to their main Finnish base at Helsingfors, the cruisers to Reval, and the smaller craft to the various harbours in the Aland Islands, the Moën Sound, and elsewhere. With only ice-breaking ships moving, the *personnel* as a whole was bound to be susceptible to the spirit of unrest prevailing on shore, and, more significant still, to the insidious German propaganda. Lack of employment, combined with lack of good leadership such as had distinguished the Fleet under Admiral von Essen, made the Baltic Fleet ready to join in and assist the revolutionary movement as soon as it took shape. The regrettable excesses committed by the seamen at Kronstadt and Helsingfors in the days following March 9, 1917, need not be Revolutionary outbreaks in the Russian Fleet.

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recorded here in detail, but it may be mentioned that Admiral Nepenin was shot at Helsingfors on the 19th, with Admirals Protopoff, Nebolsin and several other officers. Admiral Nepenin's last message to the Admiralty concluded with the words:—"The Baltic Fleet has ceased to be a military force." By the series of decrees enacted by the Provisional Government, the entire Russian Navy was soon in a similar condition. It offered no effective opposition to the enemy, and virtually resigned the control of the Baltic waters to the Germans. On September 16, 1917, the German forces took possession of the Riga Gulf, having destroyed the obstacles and swept up the mines. They then occupied the islands of Oesel, Moën, Dago, Schindau, Abre, and Runo, capturing many thousands of prisoners and much booty. In some fighting on October 17th, the battleship Slava was sunk. The Germans also destroyed at least three Russian destroyers by mines—the Burakoff on August 12th, the Okhotnik on September 26th, and the Dyelnyi on November 27th. Reval was captured by the Germans on February 25, 1918, and Abo (in Finland) on March 12th. At the latter place three torpedo-boats and some mine-sweepers were seized by the enemy, and it was also reported that they captured eight old submarines at Reval. The armoured cruiser Admiral Makaroff was also sunk at the entrance to Reval Harbour by striking a mine.

British submarines destroyed.

In the six days from April 3rd to 8th, the seven British submarines remaining in Russian waters were destroyed by order, to prevent them falling into enemy hands on the approach of the Germans to Hango (South-West Finland). Four boats of the E type were taken outside Helsingfors on the 3rd, blown up, and sunk; between that date and the 8th three C-boats were demolished. Two of the E-boats had been working in the Baltic since October 15, 1914, these and the others of the class proceeding by way of the Skaw and the Sound. The C class, however, sent out from England in August, 1916, were towed to Archangel and there floated on lighters for inland water transport to Kronstadt, where they were unloaded on September 19, 1916. The successes of the British submarines included the torpedoing of the Moltke, Prinz Adalbert, and Undine, and a large number of merchantmen. One E-boat sank six merchant vessels in a single day. Opportunity was always given for the crews of merchant ships to escape, and in this respect the British seamen showed the Germans how a submarine blockade might have been carried out with due regard for humanity.

Murder of Captain Cromie.

A dastardly outrage on August 31, 1918, by Bolshevist troops was the murder of Captain F. N. A. Cromie, R.N., whilst defending the British Embassy at Petrograd, which the Bolshevists had

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forcibly entered. Captain Cromie was formerly in command of the Baltic submarine flotilla, and at the time of his death was serving as Naval Attaché.

MEDITERRANEAN.

On the conclusion of the Dardanelles undertaking, the main tasks of the Navy in the Mediterranean were the protection of the important trade routes there against the submarine, and of the transport of troops and supplies for, and general support of, the military expeditions at Salonika and in Mesopotamia and Palestine. At one period in 1916, the submarine menace assumed proportions which led to certain steamship lines deflecting their vessels to the Cape route, but in June the Nederland Company reverted to the use of the Suez Canal. It was in this month that U 35, Lieut. von Arnauld, put into Cartagena, ostensibly to deliver an autograph letter from the Kaiser to King Alfonso, but really to establish if possible the right of German submarines to use Spanish ports. The attempt was futile, although Germany appeared to be trying forcible persuasion by the number of Spanish steamers sunk by U-boats. In June, 1917, after another visit from UC 52 to Cadiz, King Alfonso signed a decree forbidding submarines of all belligerent nations from navigating Spanish waters, and when in the following September UC 93 put into Cadiz she was interned. Other submarines were interned at Santander, Ferrol, and elsewhere.

Submarines in Spanish ports.

Reference was made in the 1916 *Naval Annual* to the bombardment of military positions on the Bulgarian coast in the Ægean Sea, after the Bulgars entered the war in October, 1915. A further bombardment of Dedeagatch was reported on June 23, 1916. On August 25th, Kavalla was occupied by the Bulgarians, and orders were therefore given to naval aircraft to carry out attacks on the lines of communication beyond the town. Railway stations and other points of importance at Buk, Drama, Doksat, and Okgilar were bombed between the 25th and 31st, and on the 28th the Kavalla forts were attacked, with excellent results. British monitors also shelled Kavalla from the sea, on August 25th, and on subsequent dates, and the Fleet continued to cruise along the Ægean coast before Kavalla and Electheran, in the Gulf of Orfani. On September 20th, the existence of a state of blockade was notified between the mouth of the Nestos and the village of Chaiaghizi; and two days later the G.O.C. at Salonika reported that: "On our Struma front ships of the Royal Navy shelled the enemy in the neighbourhood of Neohori with satisfactory results." Continuing attacks from the air, British machines, on November 29th, attacked the enemy seaplane base at

British monitor on Macedonian coast.

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Gereviz, and next day a bomb attack was made on Doksambos, and on a troop train near Porna. The Kuleli-Burgas Bridge, south of Adrianople, was attacked on December 14th by a squadron of naval aeroplanes, and Razlovoi (forty miles east of Istip, Serbia) was attacked on the following day. One span of the railway bridge over the Maritza River at Kuleli-Burgas was reported to have been completely wrecked in an attack on January 4, 1917. Attacks by sea and air continued at frequent intervals during 1917 when desired, and mention may be made in particular of a raid on Adrianople on the night of September 2nd, bombs being dropped on the railway station and bridge with good effect.

Surrender of the Greek Fleet.

The attitude of Greece in the summer of 1916 necessitated measures being taken by the Allied Fleets. On September 1st, an Allied Squadron, under Admiral Dartige du Fournet, arrived off the Piræus and took over control of the establishments there, and the wireless services in the Greek warships. On September 25th, M. Venizelos left for Crete and proclaimed a Provisional Government there on the 28th, to which various units in the Greek Fleet seceded. In the spring of the same year, the British Navy had taken possession of Suda Bay, to use it as a base for anti-submarine work, and simultaneously the Greek Government was informed that no territorial acquisition was intended. On October 11th, the Allied Admiral, off Athens, demanded the surrender of the Greek Fleet, except the Georgios Averoff, Lemnos, and Kilkis; with the control of the Piræus-Larissa railway. These demands were complied with under protest, and the islands of Leros and Kyra, in the Gulf of Salamis, were also occupied by French marines. Landing parties from the Fleet proceeded to Athens on October 16th; on November 5th the French flag was hoisted over the Greek flotilla at Keratsini, and on November 7th the arsenal on Salamis Bay was taken over.

An ultimatum on November 25th, requiring the Athens Government, in proof of its good will regarding disarmament, to hand over ten batteries of mountain guns, not having been complied with, Allied troops landed at the Piræus on December 1st, and were fired upon by the Greeks. In the evening, the guns of the Fleet came into action to silence Greek batteries shelling the Zappeion, from which 600 British and French marines marched out next day under a Greek guard—a matter which was criticised as inflicting a humiliation on the Royal Marines, who were not allowed to fight their way out. On December 2nd, a blockade of Greece was instituted, to be maintained until the Athens Government furnished adequate reparation. The Allied naval and military detachments re-embarked on the 4th. A change in the Commander-in-Chief in Grecian waters

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was made on December 13th, Vice-Admiral Gauchet replacing Admiral Dartige. The various measures subsequently taken, which led up to the abdication of King Constantine on June 12, 1917, were more political and military than naval. Constantine left for Messina, *en route* to Switzerland, on the 13th, and the blockade was immediately raised after his departure.

The Navy continued to afford protection to the Expeditionary Force at Salonika down to the close of hostilities. The British policy in retaining a force at this base was often criticised, and in a discussion on March 5, 1917, Mr. Pringle, M.P., pointed out that such ventures reduced transport facilities and weakened our sea power. Every British soldier sent to Salonika involved the withdrawal of four tons of shipping, and the Mediterranean was infested with submarines, so that every transport had to be convoyed. In replying for the Government, Mr. Bonar Law said, that if the force were withdrawn, the whole Balkan Peninsula would be in the enemy hands. The subject of Salonika had been very difficult because the Allies who were interested in Greece and the Balkan Peninsula had not always taken the same view as to the right policy to adopt, but in this respect he believed some ground had recently been gained.

Constantinople raided by British aircraft.

The Allied forces in the Eastern Mediterranean came chiefly into action in operations against the Turks. Monitors and other units continued to make attacks on suitable positions, such as Sedd-el-Bahr, and much important work was done by aircraft. On the evening of April 14, 1916, three naval aeroplanes, under Squadron-Commander J. R. W. Smyth-Pigott, R.N.A.S., flew to Constantinople and bombed the Zeitunlik powder factory and the aeroplane hangars—a flight of over 300 miles, with wind, rain, and thunderstorms on the return journey. Another remarkable raid over Constantinople took place on July 9, 1917. A large British bombing aeroplane of the Handley-Page type flew from England (where she was built) to a Mediterranean base, accomplishing the journey in a series of eight flights. For the 2000 miles flown, the machine was in the air just over thirty-one hours. On the night of the raid the Goeben, surrounded by warships, including submarines, was distinguished, and an attack made on her from a height of 800 feet, direct hits being obtained, causing explosions and fires. Another hit was obtained on the War Office. The Turks were completely surprised, as until the bombs dropped no anti-aircraft batteries opened fire. Later, in 1917, it was announced that a Greek naval unit was co-operating with the British aircraft in operations against the Turks in Gallipoli.

On January 20, 1918, the Goeben and Breslau made a sortie from the Dardanelles, and attacked to the north of Imbros the British

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Sortie of Goeben and Breslau.

monitors Raglan and M 28, which were sunk. On returning, the Breslau struck a mine off Kephalo and sank within ten minutes. The Goeben was forced by aircraft to head for the Dardanelles, and in turning to do so she also struck a mine, but was able to reach the Straits and beach herself on Nagara Point. Turkish destroyers, which had previously emerged, were engaged by the Tigress and Lizard, and hurriedly retired, one being repeatedly hit and set on fire. Although several air attacks were made on the Goeben whilst aground, she was refloated and taken back to Constantinople before midnight on the 27th. Submarine E 14, Lieutenant Geoffrey S. White, proceeded to the Dardanelles with orders to complete the destruction of the Goeben on the night of the 27th, but was destroyed by gunfire off Kum Kaleh, only seven men being saved.

Among the warships lost in the Mediterranean by submarines or mines in 1916–18 were the battleships Russell, Cornwallis, and Britannia. The first-named, Captain W. Bowden-Smith, flying the flag of Rear-Admiral S. R. Fremantle, struck a mine on April 26, 1916, and was sunk with 126 officers and men. The Cornwallis, Captain A. P. Davidson, was torpedoed on January 9, 1917, without loss of life, the ship remaining afloat for two hours. The Britannia, Captain F. W. Caulfeild, was torpedoed on November 9, 1918, in the western entrance to the Straits of Gibraltar, and sank three and a half hours later, thirty-nine officers and 673 men being saved.

Japanese Naval aid to the Allies.

From the spring of 1917 onwards, the Japanese Navy lent valuable aid to the Allied Fleets in the Mediterranean by the despatch and maintenance of a torpedo flotilla in that sea, under the command of Rear-Admiral Kozo Sato. On May 4, 1917, when the transport Transylvania was torpedoed, Japanese destroyers, skilfully handled, saved a large proportion of the 4000 soldiers and nurses on board, at the risk of being likewise torpedoed. The Sakaki, one of these destroyers, was unfortunately torpedoed and damaged, with the loss of fifty-five of her crew, on June 11th. On July 22nd, a Japanese destroyer, on escort duty, reported that she had attacked and undoubtedly destroyed a submarine. On other occasions aid was brought to stricken ships and rescue work carried out with the assistance of smoke-screens. The Japanese Naval Attaché at Rome, on March 6, 1918, declared to an American interviewer that fifteen enemy submarines had been destroyed in one month by American and Japanese destroyers working in conjunction with the Allied Fleet.

Inter-Allied Naval co-operation.

The Allied naval policy in the Mediterranean suffered somewhat in the early part of the war from a lack of unity of control and co-operation of effort. On January 24, 1917, a conference was held

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at the British Admiralty, at which Sir Edward Carson, Sir John Jellicoe, Vice-Admiral Oliver, and Commodore Halsey met representatives of the French and Italian Navies, "to discuss and determine questions relating to the Naval policy of the Allied Fleets in the Mediterranean," and it was reported that decisions were reached affecting not only the naval operations but also the use of shipping and cognate problems. This was a step towards unity of control. Further progress was made after America came in. On December 4, 1917, the creation of a Supreme Naval Council of the Allies was announced, and one of the acts of this Council, after considering the position in the Mediterranean, was to refer to a Committee, to meet at Rome, the subject of anti-submarine warfare. The Committee accepted the proposals put forward by Vice-Admiral Sir Somerset Gough-Calthorpe, Commander-in-Chief in the Mediterranean, and it was agreed early in 1918 that he should forthwith adopt and adapt to the Mediterranean the measures which had given such success around the British Isles, and that the main anti-submarine operations decided upon should be undertaken under Admiral Calthorpe's orders.

Adriatic.

The command in the Adriatic continued to be exercised by the Italian Fleet, with which British and French, and in 1918 American forces co-operated. During 1916 there was a certain amount of cross-raiding by air and torpedo craft, and enemy submarines issued from the Austrian ports to take part in the war on merchantmen, claiming also a few victims among the warships. The Italian destroyer Impetuoso was torpedoed and sunk on July 10, 1916, and another destroyer on October 16, 1916, but the enemy boats failed to repeat their success of the previous year against the larger ships like the Amalfi. On the night of December 11, 1916, however, the battleship Regina Margherita was sunk by mines.

British drifter line.

The British drifter line in the Otranto Straits, like that in the Straits of Dover, constituted a target which the enemy was naturally expected to attack at a favourable opportunity, but the means for its protection proved efficacious in nearly every case of attempted raid. On July 9, 1916, however, the Austrian cruiser Novara came upon a group of drifters, and sank two and damaged two more before help could arrive. A larger attack, the biggest of its kind, occurred early in the morning of May 15, 1917. Austrian light cruisers, subsequently reinforced by destroyers, succeeded in sinking fourteen British drifters and making prisoners seventy-two men from their crews. The crews of these drifters behaved with the greatest

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gallantry and continued to fire their guns until their ships were sunk. The Dartmouth, Captain A. P. Addison, with the Italian Rear-Admiral on board, and the Bristol, immediately chased the enemy off, assisted by French and Italian destroyers, until near to Cattaro, when, some Austrian battleships coming out in support, the Allied ships withdrew. On the passage back the Dartmouth was struck by a torpedo from a submarine, but was able to return to port.

Sinking of the Leonardo da Vinci.

A serious injury to the Italian Fleet was the sinking by fire and explosion, on the night of August 2, 1916, of the battleship Leonardo da Vinci, in Taranto harbour, with the loss of 248 officers and men, including the captain and commander. According to the statement presented in February, 1919, to the Reparations Commission of the Peace Conference, the Italian Navy lost in the war eight capital ships, eight submarines, and twenty-five small craft; in addition to 880,000 tons of merchant shipping, or 57·5 per cent. of her total tonnage.

In May, 1917, a force of British monitors came into action in support of the Italian military forces by bombarding the Austrian communications with Trieste, and by enfilade fire on the Nermada ridge. This was the beginning of a series of amphibious operations which continued until the end of the War. The naval forces were of great value during the Italian retreat which began in October, 1917, when British monitors co-operated with the Italian Army in opposing further progress by the enemy in the inundated region at the mouth of the Piave.

Italian torpedo enterprise. Enemy battleships sunk.

On the night of December 9–10, 1917, the Italian torpedo flotilla scored a success against the Austrians at Muggia, the new port of Trieste. Making their way among the obstructions, the torpedo craft stopped at or near the entrance to the harbour, and two motor scouts proceeded, guided by Commander Luigi Rizzo, a former Merchant Service officer who knew the coast thoroughly. Cutting the wire entanglements, Rizzo's boat entered the harbour and discharged two torpedoes at the battleship Wien, which was sunk. The second scout discharged two torpedoes at another battleship of the Monarch type, the Budapest, but this vessel was damaged and did not sink. Six months later, on June 10, 1918, near the Dalmatian Islands, Commander Rizzo, with two motor scouts with torpedoes, attacked and sank the Dreadnought battleship Szent Istvan. This ship and another battleship, escorted by ten destroyers, were completely surprised by the audacity of the attack. Rizzo stated that just before daybreak he sighted the division and made straight for it. He was not seen or heard, and at the right moment he slipped in between the second and third of the escorting destroyers,

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which opened fire over his craft. He got his two torpedoes well home on the leading ship, and darted away again, pursued by a destroyer, against which he dropped two depth charges which holed the vessel and compelled her to abandon the pursuit. Sub-Lieutenant Aonzo, in company, discharged his torpedoes at the second Dreadnought and hit her astern. This Italian success apparently disorganised the plans for an Austro-German Fleet operation on June 14th, the Szent Istvan and her consorts being *en route* for Cattaro to concentrate for the proposed attack. One group, including the Dreadnoughts, would have gone north of Brindisi to engage the Allied Fleet; a second, composed of lighter units, was to attack the drifters and small craft in the Otranto barrage; while thirdly, a force of submarines was to have been stationed outside the entrances to Avlona and Brindisi to torpedo Allied ships coming out. The project evidently collapsed after Rizzo's daring feat.

Allied raid on Durazzo.

A raid on Durazzo on October 2, 1918, was planned to synchronise with the Austrian retirement in Albania. Three Italian battleships and three British cruisers, protected by Allied torpedo craft and American submarine-chasers, passed through the minefields, eluded submarine attacks, and approached close to the harbour works in order to open a bombardment, which lasted for over two hours. The only damage sustained by the attacking forces was by a torpedo from a submarine striking the stem of a British cruiser, which, however, continued the firing and returned under her own steam to her base. During the bombardment four motor launches under Commander Bertonelli went within 900 yards of the quayside in the centre of Durazzo and attacked two Austrian destroyers and a torpedo-boat, one of the former being sunk. A large Austrian armed transport was also sunk.

Viribus Unitis sunk.

Continuing their active support, the Allied torpedo craft on October 22nd appeared at the entrance to the small port of San Giovanni di Medua (Albania) to counter the fire of the coast batteries. An Italian torpedo-boat entered the harbour, torpedoed the only vessel found there, and regained the open sea without damage. What was probably the last feat of individual daring of this kind before hostilities closed occurred on the night of October 31, 1918, when Engineer-Commander Raffaele Rossetti and Medical-Lieutenant Raffaele Paolucci got into the inner roadstead at Pola and destroyed the Austrian flagship Viribus Unitis. These officers used a small boat driven by a motor operated by compressed air, and had with them two torpedoes to be attached to the hulls of enemy ships. Commander Rossetti swam to the Viribus Unitis and attached one of these machines, which shortly afterwards exploded

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and destroyed the ship. He and his colleague were discovered and made prisoners.

Commerce Raiding and the German Colonies.

The raider Möwe.

In the *Naval Annual* for 1916 it was shown how all the cruisers which Germany had in the outer seas when war began had been swept away, and how only one attempt to put a disguised mercantile cruiser on the trade routes had succeeded, this being the case of the Möwe, which made a haul of shipping in the Atlantic, including the capture of the Appam, between January and March, 1916. This raider made a second successful attempt to run the British blockade in the following winter. She was discovered at work in the Atlantic early in December, 1916, and her return to Germany was officially announced on March 23, 1917. During this period she destroyed or captured twenty-two steamers and five sailing vessels. One victim, the Yarrowdale, was sent back to Germany on December 31, 1916, with a prize crew and 469 prisoners from various ships sunk. The total tonnage accounted for was 107,635, or nearly double that of her first raid.

On March 16, 1917, the cruiser Achilles, Captain F. M. Leake, and the armed boarding steamer Dundee, Commander Selwyn M. Day, R.N.R., forming a patrol which had been instituted a year earlier by Sir John Jellicoe in an area north of the Shetlands, intercepted and sank the German raider Leopard, which was outward bound at the time. She was the British steamer Yarrowdale, which was captured by the German raider Möwe, as is recorded above. On her arrival in Germany she was converted into an auxiliary cruiser, and sent to sea disguised as the Norwegian steamship Rena. The Möwe returned to Germany in February, 1918, from a successful cruise. This vessel was said to have been absent for fifteen months, or from the beginning of December, 1916, to the end of February, 1918. She began to sink ships between Cape Verde and Rio de Janeiro on January 9, 1917, at which time she was reported to be the Seeadler, and to be driven by internal combustion engines. One of her victims, the Turritella, was equipped as an auxiliary for mine-laying and renamed the Iltis, and operated in the Gulf of Aden under the raider's first officer, Commander Brandes. Within a few days, however, she met a British warship, when her crew blew up the ship and were themselves taken prisoners. Altogether, the Wolf, so-called, under Frigate-Captain Nerger, destroyed or captured eleven vessels of 32,844 gross tons.

Möwe's second cruise.

In the 1916 *Naval Annual* it was recorded that the conjoint operations for the subjugation of German territory oversea had been

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concluded with success except in German East Africa. Guerilla operations in this theatre, as in the case of the South African War after the capture of Pretoria, continued after the capture of its capital, but the fall of Dar-es-Salaam to a combined naval and military attack on September 4, 1916, practically completed the conquest of the country. The Expeditionary Force under General Smuts was well supported throughout by the Navy, from which seamen and marines were landed with military parties for the occupation of the ports of Kilwa Kivinje and Kilwa Kissiwani, south of Dar-es-Salaam, on September 7, 1916.

Navy on East African coast.

Black Sea.

While Russia remained in the War her ships dominated the situation in the Black Sea. The presence of the Goeben and Breslau at Constantinople was never more than a temporary annoyance. Turco-German submarines were sent out on several occasions and copied the tactics of the U-boats generally in sinking not only merchantmen but also hospital ships, but they had no success of any consequence against the Russian Fleet, nor did they interfere with the blockade of the Bulgarian and Turkish coasts and ports. In the capable and energetic hands of Vice-Admiral A. V. Koltchak, who succeeded to the command in August, 1916, the Russian Black Sea Fleet was brought to a high level of efficiency, comparing very favourably in this respect with the Baltic ships. The entry of Roumania into the war on the side of the Allies on August 27, 1916, did not affect the naval position. A misfortune which befell the Russians on October 20, 1916, was the destruction by fire and explosion of the Dreadnought battleship Imperatritsa Maria, with the loss of about 200 lives.

Successful work of Russian Fleet.

Early in 1916 the victorious advance of the army of the Grand Duke Nicholas in the Caucasus was made possible, and well supported, by the power of the Fleet. The Turkish coast batteries between Rizeh and Batum were shelled during February, and on the night of March 4th troops were thrown ashore for the capture of Atina, at the same time that other ships demonstrated off Trebizond. This turning of the Turkish flank conferred a great advantage upon the Russian military commander. Trebizond was taken on April 18th. In regard to its use of submarines and aircraft, the Russian Navy also did effective work in the Black Sea. On one occasion, during a seaplane raid on Derkos, north-west of Constantinople, a machine was damaged and compelled to alight on the water. During the descent, the two occupants observed a Turkish schooner, and by

Co-operation with Military forces.

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means of their machine-gun drove the crew from the deck, leaving the way clear for them to board and capture the vessel.

Mutiny of Russian seamen. Germans in the Black Sea.

At the time of the Revolution, the strong hand of Admiral Koltchak saved a good deal of bloodshed. He was in close touch with the Admiralty in Petrograd, and during the critical days of negotiations in March, 1917, put to sea with the main part of his Fleet. When the Tsar had actually abdicated, and order seemed likely to be restored, he was informed by wireless. He explained the situation to his officers and men, and returned to Sebastopol, a resolution of confidence in the Provisional Government being passed. When Bolshevism grew to such an alarming extent in the Baltic, Koltchak was offered the command there, but he reported after a tour of inspection that the conditions were desperate. In May, 1917, delegates from Kronstadt came to Nikolaieff for Bolshevist propaganda, and when the Admiral endeavoured to counteract their work by appeals to common sense and patriotism he and his staff were accused of counter-revolutionary tendencies, and he resigned his command. This satisfied the malcontents, who did not arrest the Admiral, as at first intended. His successor, Rear-Admiral Nemetz, was forced to make large concessions to the men. He also resigned in January, 1918, after massacres at Sebastopol. Odessa was captured by German troops on March 13, 1917, but on the 26th its recapture by loyal Soviet and Ukraine troops was reported. Admiral Sablin was appointed in command on April 1st, but he was as powerless as his predecessor to stem the tide of Bolshevism. By June, the Bolshevists had given up the greater part of the Black Sea Fleet to the Germans, although certain vessels were sunk by their own crews to prevent this fate. In May, the Goeben and some Turkish torpedo boats proceeded to Sebastopol, and the former sustained some damage which the dockyard workmen refused to repair. When, after the armistice, the Allied Fleet found the Goeben in Stenia Bay, in the Bosphorus, she had a Turkish crew on board under a Turkish admiral, Arir Pasha; the Germans on leaving had taken all the plans of the ship and her engines, with the fire-control and other instruments, so that the Turks could only find out details of her mechanism by actual inspection.

Close of the Sea War.

The end of the war was at length brought about by successful military campaigns against Bulgaria and Turkey, Austria and Germany, undertaken and maintained by means of the open sea communications guaranteed by the Allied navies. The defeat of the enemy armies in the field was hastened by the economic stringency

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set up by the Allied blockade, which also weakened the morale and power of resistance of the civil population. In an appreciation of the work of the Tenth Cruiser Squadron, which carried out the blockade in the North Sea and Atlantic from the beginning of the war, Lord Jellicoe says in his book:—"The decisive effect of the blockade did not become apparent until the end, when the final crash came, and it was seen how supreme an influence on the result of the war this powerful weapon had exercised."

Armistice with Bulgaria.

It was on September 26th that British troops entered Bulgarian territory on the road to Strumnitza, and next day the Cabinet of M. Malinoff applied to the Allies for an armistice. They were referred to General d'Esperey, commanding the armies at Salonika, and by the 30th had accepted unconditionally the terms laid down by the General.

Allied Fleets off Constantinople.

The downfall of Bulgaria had its effect upon Turkey, already hard pressed by the brilliant advance of General Sir Edmund Allenby's troops, the final phase of which began on September 19th. Towards the end of October, General Townshend was liberated by the Turks to inform Vice-Admiral Sir Somerset Gough-Calthorpe, in the Ægean, that they wished to open negotiations, and an armistice was signed on the 30th, to take effect from the following day. On November 11th, the appointments of Admiral Calthorpe as High Commissioner at Constantinople, and of Rear-Admiral Richard Webb as Assistant High Commissioner, were announced. On the same day, the French destroyer Mangini and British destroyer Shark entered the Dardanelles, from which the mines had been swept, and proceeded to Constantinople. Two days later, the Allied Fleet, with Admiral Calthorpe's flag in the Superb, passed through and anchored in the Gulf of Ismid. On November 18th, Vice-Admiral Amet, commanding the French squadron in the Bosphorus, was appointed High Commissioner of the French Republic to the Turkish Government. By December 5th, the Turkish vessels, including the Goeben, had been interned. On November 26th, the Allied Fleet proceeded to Sebastopol.

Armistice with Austria.

Robbed of the support of their Allies in the near East, it was only a matter of time before the Central Powers were forced to sue for terms. The operations against the Austrians, at Durazzo, in October, have already been referred to. These operations coincided with offensive movements on land by the Italian armies. It was on October 28th that Austria appealed to President Wilson for an immediate armistice, and on the 31st that a similar appeal was made direct to General Diaz, the Italian Commander-in-Chief. Hostilities eventually ceased at 3 p.m. on November 3, 1918.

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Mutiny in the High Seas Fleet.

In Germany, the succession of Count von Hertling as Imperial Chancellor, on September 30th, by Prince Max of Baden was immediately followed, on October 6th, by a note to President Wilson asking him to negotiate peace. After correspondence, the Allied and Associated Powers met at Versailles, and by November 5th had agreed to the terms to be submitted to Germany for acceptance, these being sent to President Wilson for him to inform the Germans that, if they wished to know the terms, they should apply to Marshal Foch, with whom a British Admiral would be associated. During these negotiations, not only were the Allied armies advancing on the Western front, but a revolutionary movement had sprung up in Germany. In the first week of November, the German High Sea Fleet had been ordered to put to sea in a final desperate enterprise. The crews, already seething with discontent, then broke into open mutiny. Kiel and Hamburg by November 7th were reported to be in the hands of workmen's and soldiers' committees. Next day, a German commission met Marshal Foch and Admiral Sir Rosslyn Wemyss, and was given until 11 a.m. on Monday, November 11th, to accept or reject the armistice terms. The armistice was signed at 5 a.m. on the 11th, and hostilities ceased on all fronts at 11 a.m.

On November 13th, the light cruiser Königsberg brought to a rendezvous off Rosyth the representatives of the Provisional Government of Germany, and the plenipotentiaries of the Workmen's and Soldiers' Council of the High Sea Fleet, to meet the British Navy's representatives. On the 15th, Rear-Admiral Hugo von Meurer, with four officers of his staff, waited on Admiral Sir David Beatty, on board the Queen Elizabeth, the British Commander-in-Chief refusing to meet the Workmen's and Soldiers' delegates. In accordance with arrangements then made, the following force was surrendered to the British Grand Fleet on November 21st :—

Battleships.

Surrender of German battleships, cruisers and destroyers.

Friedrich der Grosse, flagship of Rear-Admiral von Reuter, commanding the force.

König Albert.	Kaiserin.	Prinzregent Luitpold.
Kaiser.	Bayern.	Grosser Kurfürst.
Kronprinz Wilhelm.	Markgraf.	

Battle Cruisers.

Seydlitz, flying the broad pennant of Commodore Taegert.

Derfflinger.	Hindenburg.
Von der Tann.	Moltke.

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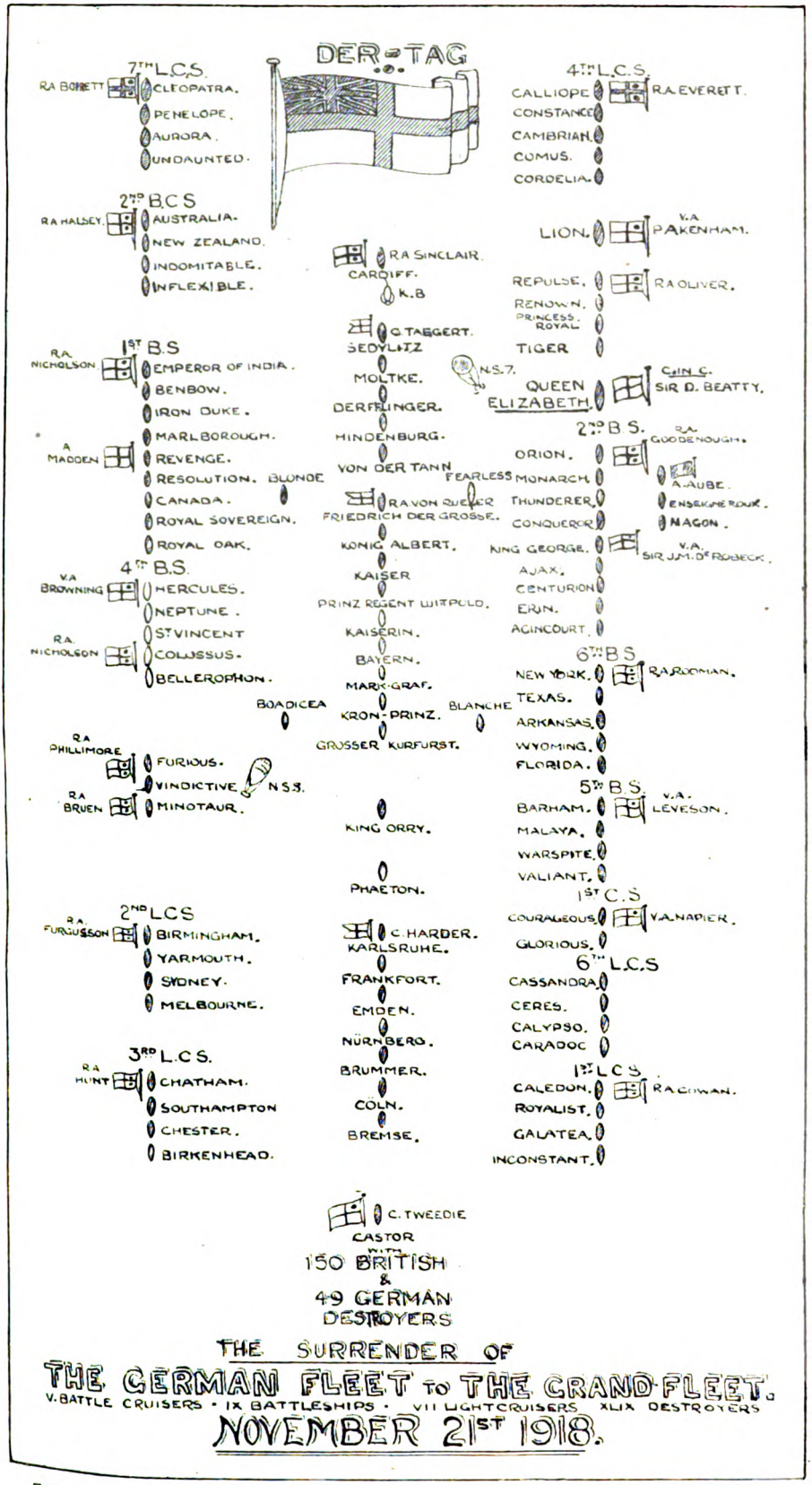

FACSIMILE OF THE PLAN PREPARED ON BOARD THE GRAND FLEET FLAGSHIP QUEEN ELIZABETH

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Light Cruisers.

Karlsruhe, flying the broad pennant of Commodore Harder.

Frankfort.	Nürnberg.	Köln.
Emden.	Brummer.	Bremse.

Destroyers.

Forty-nine of the latest type from the 1st, 2nd, 3rd, 6th, and 7th Flotillas.

There was one battleship, one battle-cruiser, and one light cruiser short of the numbers named by the armistice terms; and a destroyer was sunk by mine on its passage from Germany. On November 22nd, after inspection, the vessels enumerated above left Rosyth for Scapa Flow to be interned until the conclusion of Peace.

On December 4, 1918, to make up the deficiencies in the ships to be handed over, the battleship König and the light cruiser Dresden, with a destroyer, were sent to Scapa; and on January 10, 1919, the battleship Baden was also sent, in place of the Mackensen, battle-cruiser.

German submarines surrendered at Harwich.

On November 20th, twenty German submarines surrendered to the British flotillas under Rear-Admiral Sir Reginald Tyrwhitt off the Suffolk coast. On the 21st, nineteen more were received (one having broken down on the passage), on the 22nd, twenty, and on the 25th, twenty-eight boats, a total of eighty-seven. By January 1st the number had reached 114. The crews were in every case returned to Germany by transports. The total number of boats to be surrendered was 158.

An Allied Naval Commission, headed by Vice-Admiral Sir Montague Browning (Great Britain), Rear-Admiral Robison (U.S.N.), and Rear-Admiral Grasset (France), visited Wilhelmshaven, Kiel, and other German bases and establishments in December to ensure full compliance with the terms of the armistice.

CHAS. N. ROBINSON.

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CHAPTER II.

The Allied Navies in the War.

France.

Co-operation in the Channel.

Les premières mesures prises par la Marine française dans le Nord résultent des considérations stratégiques. La seconde escadre légère, commandée par l'amiral Rouyer et renforcée de quatre croiseurs britanniques, a pour objectif d'arrêter les croiseurs ennemis qui tenteraient de traverser la Manche, et d'assurer la sécurité des transports entre l'Angleterre et la France. Les grands bâtiments forment une ligne de surveillance continue entre Lizard et l'île Vierge; les sous-marins sont placés en barrages dans la Manche centrale. La croisière est renforcée, dans les jours suivants, par tous les croiseurs, croiseurs auxiliaires et éclaireurs qui ont pu être armés dans les ports, et qui aident à la surveillance des transports de troupes et des réfugiés.

A la fin d'août, le dispositif est modifié, une seconde ligne de croisière devant assurer le passage des convois pour la nouvelle base de St. Nazaire; il est supprimé, en ce qui concerne les grands croiseurs, en avril, 1915, sous la menace des sous-marins qui ont fait leur apparition dans la Manche. Dans le Pas-de-Calais, des torpilleurs et des sous-marins français concourent a la défense du détroit contre le passage des croiseurs ennemis; dispositif qui doit également être modifié bientôt, pour envisager surtout la défense de nos bases contre les sous-marins et l'attaque des bases ennemies sur la côte belge.

En Méditerranée, où le commandement appartient au commandant de l'armée navale française, le premier but poursuivi par les forces navales est d'assurer la sécurité des transports de troupes de l'Afrique du Nord. Toute l'armée navale y concourt d'abord, mais après l'entrée à Constantinople des deux croiseurs allemands, la surveillance des convois est confiée à deux divisions spéciales, l'armée navale prenant comme objectif principal le blocus dans l'Adriatique de la flotte autrichienne.

Opérations aux Dardanelles.

Le Goeben et le Breslau s'étant réfugiés à Constantinople, des forces navales françaises sont envoyées en Orient, en septembre 1914,

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pour concourir, avec les croiseurs anglais, au blocus des Dardanelles. Les deux cuirassés Vérité et Suffren participent, le 3 novembre, aux opérations de bombardement contre les ports de Seddul-Bahr et de Koum-Kalessi. Ayant décidé de faire un effort très sérieux contre les Dardanelles, l'Amirauté britannique demande à la Marine française un plus large concours, en janvier 1915. Déjà, quelques contre-torpilleurs et sous-marins avaient été envoyés et le sous-marin Saphir s'était coulé, le 11 janvier, en entrant dans le détroit.

Dardanelles expedition.

Le 31 janvier, est constituée l'escadre française des Dardanelles, commandée par l'amiral Guépratte, sous les ordres de l'amiral Carden. Elle comprend quatre cuirassés, des torpilleurs, des sous-marins, des dragueurs, et un bâtiment porte-avions. Le 19 février marque le début des opérations actives contre les forts ; six cuirassés attaquent les forts de l'entrée, le Suffren a un tir très efficace sur Koum-Kalessi. Suspendues par le mauvais temps, elles sont reprises le 25, chaque bâtiment ayant un objectif fixé.

Les premiers jours de mars, les quatre cuirassés français font une demonstration devant Boulaïr, et bombardent, du golfe de Saros, les forts Sultan et Napoléon. A partir du 6, ils participent à l'attaque générale des forts du détroit, pendant le débarquement des troupes à Seddul-Bahr et Koum-Kalessi. En même temps les dragueurs français coopèrent au déblaiement des passes, dans des conditions très difficiles et sous un feu violent. Le 18 mars, dans l'attaque à courte distance des forts, le Bouvet et le Gaulois heurtent des mines dérivantes ; le Bouvet coule avec presque tout son équipage, le Gaulois parvient à s'échouer à la côte.

A la suite de ces divers engagements, l'amiral de Robeck, qui exerce le commandement supérieur depuis le départ de l'amiral Carden, adresse à l'Amirauté le télégramme suivant : "Je désire porter à la connaissance des Lords de l'Amirauté la manière splendide dont l'escadre française s'est comportée. Elle n'est aucunement troublée par ses lourdes pertes. L'amiral Guépratte l'a conduite au feu, dans une action rapprochée, avec la plus grande bravoure. La conduite de la flotte alliée ne laisse rien à désirer. Officiers et hommes sont tous ardents pour engager de nouveau l'ennemi."

En attendant que l'armée du général Hamilton soit en mesure d'entreprendre les opérations, l'escadre française retourne dans le golfe de Saros, et prend pour base Lemnos. Le Jauréguiberry et le Henri IV viennent y remplacer le Bouvet et le Gaulois. La Marine française porte alors tous ses efforts sur l'organisation des bases du corps expéditionnaire d'Orient, et le transport des troupes et du ravitaillement. Le 25 avril, commence le débarquement du corps anglo-français : 29,000 hommes sont mis à terre le premier jour.

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Les croiseurs Jeanne d'Arc et Latouche-Tréville viennent renforcer l'action de l'escadre cuirassée. Tous les jours, un ou deux bâtiments de l'escadre Guépratte stationnent dans le détroit, tenant en respect les tranchées ennemies de la presqu'île de Gallipoli et les ouvrages de campagne d'Anatolie. Les sous-marins entrent dans le détroit et poussent jusqu'à la mer de Marmara; au cours de ces traversées périlleuses, le Joule et le Mariotte sautent sur des mines, la Turquoise est canonnée et s'échoue en mer de Marmara. La plage de Seddul-Bahr est constamment battue par le feu de l'ennemi; des canons y sont débarqués des navires, pour l'organisation d'un front de mer. Chaque bâtiment fournit une corvée pour accélérer les déchargements; sur la demande du général d'Amade, le corps de débarquement du Jauréguiberry est mis à terre pour renforcer les troupes.

Devant l'effort militaire à accomplir, les forces navales paraissent bientôt insuffisantes; l'escadre confiée à l'amiral Nicol, le 15 mai 1915, comprend six cuirassés et quatre croiseurs, avec douze torpilleurs, cinq sous-marins, vingt-cinq chalutiers et dragueurs, et de nombreux bâtiments de servitude. Elle concourt au bombardement des forts et batteries, à la surveillance d'Hellès, des passages entre les îles de l'Egée, du golfe de Smyrne, et au blocus de l'Anatolie. L'extension des bases amène le ministre de la Marine à créer, le 7 août, une Division navale des bases du corps expéditionnaire d'Orient, commandée par l'Amiral de Bon. Le Masséna et le Saghalien sont expédiés à Seddul-Bahr pour y être coulés et former un abri pour le port.

Salonika. Lorsque, à la fin de septembre, l'amiral Dartige prend le commandement de l'escadre des Dardanelles, l'échec des opérations contre Gallipoli et l'entrée en guerre de la Bulgarie amènent les alliés à reporter l'effort militaire sur la base de Salonique. Pendant qu'une partie des navires débarquent leurs équipages pour organiser cette base, les autres protègent l'évacuation de la presqu'île de Gallipoli, qui se fait avec une audace et une rapidité tout à fait remarquables. L'ancienne escadre des Dardanelles devient la 4ème escadre, chargée des opérations en mer Egée, et la défense de Salonique est assurée par la division d'Orient, composée de quatre vieux cuirassés et deux croiseurs.

Operations against Greece. En dehors de la guerre sous-marine, les seules opérations entreprises en mer Egée sont dirigées contre le gouvernement royal de Grèce. A trois reprises, une escadre spéciale interalliée est constituée pour une démonstration contre la Grèce. La dernière seule, formée le 17 juin, a à intervenir effectivement. Elle entre à Salamine le 1 septembre 1916, saisit les navires de commerce ennemis qui y sont

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internés, séquestre ensuite la flotte grecque, et participe à une action directe contre Athènes en mettant à terre les compagnies de débarquement.

Opérations en Syrie.

Levant operations

Dès la rupture des relations diplomatiques avec la Turquie, en novembre 1914, une division composée d'un cuirassé et deux croiseurs est envoyée sur les côtes de Syrie. Puis, en même temps que l'escadre des Dardanelles, est constituée, le 31 janvier 1915, une escadre en Syrie, comprenant trois cuirassés et deux croiseurs, sous le commandement de l'amiral Dartige, dans le but d'exercer une action continue sur les côtes de Syrie et d'Asie Mineure, et d'y retenir des troupes ennemies pendant l'entreprise contre les détroits.

Les croiseurs français effectuent le blocus entre le cap Khelidonia et El Arish, procédant à des actions locales sur les différents points de la côte où peuvent être détruits, du large, des camps, des dépôts de pétrole, des batteries, etc. Au cours d'une de ces croisières, l'amiral Charner est coulé par un sous-marin avec tout son équipage, ne laissant qu'un seul survivant.

A la fin d'avril, l'Angleterre, craignant une attaque contre le canal de Suez, demande le concours de nos bâtiments : trois croiseurs sont envoyés dans le canal, mais l'attaque prévue ne se produit pas. Toutefois, la défense est reprise activement en décembre 1915. Le Jauréguiberry, le Requin, puis le Pothuau, l'amiral Aube, et le d'Entrecasteaux occupent des postes dans la section III du canal, dont la défense est confiée à l'amiral de Spitz. En février 1916, l'avance des Russes fait abandonner l'idée d'une expédition contre le canal, et les troupes anglaises sont renvoyées. On ne laisse en Syrie qu'une division française, commandée par l'amiral de Spitz.

En dehors de l'action anti-sous-marine, exercée par les patrouilleurs de cette division, les croiseurs et torpilleurs continuent à effectuer le blocus des côtes de Syrie et de Caramanie, entreprenant de nombreuses opérations de détail contre les postes et établissements militaires et les voies ferrées, avec le concours d'avions britanniques et de monitors.

En 1917, ils participent aux opérations entreprises à terre par les troupes anglaises contre El Arish, Gaza, puis contre Askalon, Jaffa, remontant la côte en même temps que les troupes dont elles appuient l'aile gauche.

Les croiseurs français participent aux opérations en Arabie, où le d'Estrées conduit une mission militaire, et l'Orénoque, un chargement de pélerins de l'Afrique du Nord. Le Pothuau et le d'Entrecasteaux coopèrent avec les forces anglaises à Rabegh ; ils portent également

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leur action dans la Mer Rouge, lors des évènements d'Abyssinie, en septembre 1916.

Enfin, la Marine française occupe Rouad et Castellorizo, bases de surveillance en face des côtes turques, et contribue à la formation et au transport de la légion d'Orient, constituée à Chypre avec les populations réfugiées et sauvées par nos croiseurs.

Opérations en Adriatique.

L'entrée en guerre de l'Autriche, le 12 août 1914, amène le commandant en chef français en Méditerranée à concentrer toutes ses forces à l'entrée de l'Adriatique, dans le but de détruire la flotte autrichienne si elle tentait d'en sortir. Les croiseurs et les torpilleurs exercent une surveillance continue, que l'armée navale vient renforcer de temps en temps. Au cours de ses incursions à l'intérieur, elle coule la Zenta le 16 août, bombarde Cattaro le 30, Lissa et Pelagosa le 17 septembre, détruit les phares et câbles de Raguse Gravosa, Meleda en octobre. Elle accompage les bâtiments chargés du ravitaillement pour le Montenegro, ceux qui transportent en Serbie les diverses missions françaises : mission Picot, chargée de la défense de Belgrade ; mission Grellier pour l'installation de batteries sur le Lovcen ; mission Gignon pour l'établissement d'un grand poste de télégraphie sans fil. Les sous-marins font des croisières continuelles le long des côtes dalmates : le Fresnel et l'Ampère lancent des torpilles dans l'avant-port de Cattaro, le Cugnot reconnaît la baie de Topla à l'intérieur des Bouches, le Curie tente l'entrée de Pola où il s'engage malheureusement dans les filets.

En février 1915, la surveillance, renforcée encore pour empêcher les sous-marins autrichiens de partir pour les Dardanelles, devient difficile et dangereuse, l'ennemi concentrant tous ses moyens dans la basse Adriatique ; la Dague saute sur une mine devant Antivari, le Léon Gambetta est torpillé et coulé à vingt milles du cap Leuca.

La convention du 10 mai avec l'Italie donne à la Marine italienne l'initiative des opérations en Adriatique ; la France y contribue par l'envoi de douze contre-torpilleurs, deux divisions de torpilleurs et six sous-marins. Les opérations deviennent plus actives : pendant que les sous-marins font la croisière au large de Cattaro et sur la route des bâtiments et des sous-marins ennemis, les forces légères exercent une surveillance autour des drifters d'Otrante, qui sont l'objet de fréquentes attaques, et exécutent des raids contre les bases autrichiennes. Au cours de ces engagements, les pertes sont sensibles de part et d'autre, mais les torpilleurs français se font remarquer par leur mordant et leur audace : le 16 août, le Bisson coule le U 12

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après une chasse de toute une journée; le 20 septembre, le Papin torpille un torpilleur autrichien; le 29 décembre, le Casque coule le Triglav; mais le Fresnel s'échoue à l'entrée de la Bojana, et le Monge est coulé par l'Helgoland.

En 1916, le Renaudin, puis la Fourche sont coulés par des sous-marins; mais, à toutes les rencontres, l'ennemi est obligé de fuir devant l'attaque des alliés; le 6 février, le Bouclier avec le Weymouth obligent quatre destroyers ennemis à se réfugier à Cattaro; le 21 décembre, le Commandant Rivière et le Casque poursuivent avec acharnement une escadrille qui vient d'attaquer les drifters. Le 15 mai, dans une opération analogue, le Boutefeu, envoyé au secours du Dartmouth torpillé, saute sur une mine. Les sous-marins, croisant isolément où à la remorque des chalutiers, ont de fréquentes rencontres avec leurs similaires ennemis, dont la sortie et l'entrée de l'Adriatique deviennent de plus en plus difficiles, devant les obstacles accumulés sur leur passage: le Circé coule un sous-marin, mais le Bernouilli est coulé par un autre, et le Foucault par des avions. Cattaro.

Mais le plus gros effort de la Marine française en Adriatique a porté sur le ravitaillement et le sauvetage de l'armée serbe. Dès la fin d'octobre 1915, la situation militaire force les alliés à envisager le ravitaillement de l'armée serbe par la côte d'Albanie. Des approvisionnements considérables sont envoyés à Brindisi, et de là aux deux bases de Medua et Durazzo, où une mission française établit la liaison avec l'armée serbe. Tous les petits bâtiments et les paquebots disponibles à un moment où l'armée d'Orient absorbe presque tous nos moyens, sont envoyés en Adriatique pour concourir à ces transports. Support and evacuation of the Serbian army.

A la fin de décembre, le gouvernement français décide d'évacuer l'armée serbe sur la Tunisie, et deux croiseurs cuirassés, avec des paquebots et des navires hôpitaux, commencent aussitôt le mouvement. Mais le temps presse et le voyage est trop long pour une armée épuisée par la fatigue et le choléra: le 11 Janvier, la division Chocheprat procède à l'occupation de Corfou, et, un mois après, toute l'armée serbe se trouve à Corfou, répartie dans les camps et les hôpitaux montés avec une rapidité remarquable. Tout le matériel qui a pu arriver à Medua et à Durazzo est sauvé, sous le feu de l'ennemi, par les petits caboteurs français et italiens. Au cours de ce transport, effectué dans des circonstances difficiles et dangereuses, nous perdrons seulement trois petits bâtiments, Jean Bart, Ginette et Memphis, le premier torpillé; les deux autres minés; mais pas un Serbe n'était perdu en mer.

Soignée dans les hôpitaux de Corfou, de France et d'Algérie réorganisée dans les camps de Corfou, l'armée serbe repart de

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Corfou pour Salonique, entre le 12 avril et le 27 mai ; effectué sous la protection de la presque totalité de nos patrouilleurs, ce transport apparaît comme une opération de vive force, exécutée avec une rapidité croissante et sans aucune perte.

Action anti sous-marine.

Dès le début de 1915, la Marine française entreprend l'organisation de la défense contre la guerre sous-marine commerciale, qui n'avait pu être prévue avant la guerre. Elle comporte la création, par étapes, d'une flotte de patrouilleurs de toutes sortes, chalutiers, dragueurs, canonnières, avisos, etc., et d'une flotte aérienne dont le développement prend, à la fin de la guerre, des proportions considérables. Suivant la marche progressive des croisières ennemies, des escadrilles de patrouille sont établies successivement dans la Manche, puis dans l'Océan et la Méditerranée ; il y en a 22 en Juin, 1916, avec un total de 550 bâtiments, qui s'élève à 790 en 1917 et à 960 en 1918.

L'aviation maritime se développe parallèlement, avec des effectifs atteignant 300 hydravions en 1917, 1000 au début de 1918, 1500 à la fin de la guerre, répartis en 44 centres et 14 postes de combat ; un grand nombre de ballons dirigeables et de ballons captifs destinés à l'escorte des convois et la recherche des mines et des sous-marins. Dans toutes les mers, les patrouilles aériennes et maritimes françaises exercent leur action, offensive et défensive, pour la protection des navires de commerce et la chasse des sous-marins, en liaison intime avec les patrouilles britanniques. Des deux côtés de la Manche, comme dans différents secteurs de la Méditerranée, les chefs alliés sont en communication constante pour la répartition de leurs forces dans l'escorte des convois et la protection des navires.

On peut dire que toute l'action défensive est commune ; quant à l'action offensive, elle se fait d'après les mêmes méthodes, mais dans la flotte française, c'est seulement dans la dernière année de la guerre que le nombre des unités rapides est suffisant pour permettre l'organisation méthodique de la chasse, que l'adoption généralisée de l'appareil d'écoute Walser permet de rendre fructueuse.

French losses.

Le bilan de la guerre se traduit par les pertes suivantes, subies par la Marine française :—

4 cuirassés,
5 croiseurs,
15 destroyeurs,
8 torpilleurs,
13 sous-marins,

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5 canonnières ou chasseurs,
6 croiseurs auxiliaires,
70 chalutiers, dont près de la moitié coulés au cours de dragages de mines.

Guerre sur terre.

En dehors des opérations purement maritimes, le Marine française a à faire face, dès le début des hostilités, à de nombreuses obligations, que, pour la plupart, elle s'est imposées volontairement. Elle transforme la plupart de ses arsenaux en usines de construction de matériel de guerre, elle prend à sa charge la défense des côtes, procède à l'installation des bases, dans de nombreux ports, pour le débarquement et le ravitaillement des armées alliées. Tout le personnel qu'elle peut rendre disponible en comprimant ses besoins propres, elle le verse à l'armée, et constitue même, dès le mois d'août 1914, un régiment de marins pour la garde de Paris. L'amiral Ronarch est chargé de l'organisation de ce régiment, qui devient bientôt une brigade assez entraînée pour être admise à participer à la bataille de la Marne, puis aux opérations en Belgique où elle prend une part héroïque, en particulier dans la défense de Dixmude et de Steenstraete.

En même temps, un corps de canonniers marins, avec du matériel de marine, arme d'abord les forts du camp retranché de Paris, puis participe aux opérations de l'armée par des batteries fixes dans les places fortes de l'Est, et des batteries mobiles incorporées dans l'artillerie lourde. Des marins arment également des autos-canons, des autos-projecteurs et des batteries anti-aériennes.

Enfin, la constitution des canonnières fluviales, décidée en avril 1915, est réalisée dans le courant de l'année ; ces canonnières sont groupées en batteries de quatre unités, armées de canons de quatorze ou de dix, et participent aux opérations, de la Belgique à l'Aisne, jusqu'à la fin de 1917 ; elles sont désarmées à ce moment, mais quelques-unes sont réarmées à la fin de 1918 pour faire partie de la flottille de surveillance du Rhin.

L'Etat-Major Général de la Marine.

Italy.

There were no Fleet actions in the Adriatic during the war. Owing to the absence of suitable harbours the Italian Battle Fleet was based on Taranto. Brindisi and Venice, already crowded with warships and minor craft, suffered from certain disadvantages. Both harbours, and especially Venice, were within easy reach of attack. Taranto was never attacked from the air, while Venice and Brindisi,

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especially the former, were very frequently the objective of the Austrian airmen. Valona, which we had seized shortly before, laboured under the same inconveniences, and would have involved, as a Fleet base, an almost daily traffic of transports and colliers which Italy could ill have spared.

Adriatic strategy.

Between the enemy ports of Pola and Cattaro communication was always possible by the Dalmatian channels, while keeping out of reach of our main forces. It was essential, therefore, that these should be kept south of the most southern enemy port. The French Fleet being at Corfu and the Italian Battle Squadron at Taranto, the gate-keeping of the Adriatic was complete. Occasionally the Battle Squadron was moved to Corfu, and opportunity taken to perfect tactical arrangements with the French Fleet in case of concerted action being necessary. Our squadron of six Dreadnoughts was short of two units not completed on the declaration of war, but the British Admiralty reinforced it with four battleships of the Queen class, which were afterwards withdrawn when the French Fleet at Corfu had been reinforced. To our capital ships available should be added the four Regina Elenas and the Margherita and Brin.

In the early stages of the war these last six ships worked mostly between Brindisi and Valona, but afterwards, when it was clear that Austria kept at Cattaro only light-cruiser and torpedo forces, the four Regina Elenas returned to Taranto. The Margherita and Brin were both sunk with very heavy loss of life. The former was blown up by an enemy mine, when leaving Valona at night, in stormy weather, and the latter blew up at anchor at Brindisi through an internal explosion. Admiral Rubin, one of our most able division commanders, lost his life on the occasion. It may be recalled also that the Leonardo da Vinci was blown up by internal explosion while at her moorings in the Mar Piccolo of Taranto on August 2, 1916.

Allied co-operation.

On Brindisi were based light-cruiser forces, three Italian and four British, and three groups of fast scouts respectively of the Aquila, Mirabello and Poerio classes. Of the destroyer force, whose insufficiency in numbers was sorely felt throughout the war, the older types were kept in the Mediterranean, in increasing number for escorting duties, as the submarine war became more threatening. The modern units and our excellent small torpedo boats were mostly divided between Brindisi and Venice. At Brindisi our destroyer force was reinforced by a number of French and British destroyers. Our submarine flotillas were divided between Venice, Ancona and Brindisi, and were supported by several French and British submarines, massed mostly at Brindisi. In the latter period of the war, when conditions admitted of a strong force of British destroyers being

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based on Brindisi, we were able to concentrate most of our modern destroyers at Venice. The French flotilla went east to reinforce the Anglo-French squadron watching the Dardanelles. Our cruiser force was much reduced by losses and by converting the older types into troop transports, or floating batteries for harbour defence.

Adriatic and North Sea—an analogy.

It may be remarked here that there was a curious similarity in the distribution for war of the naval forces of Italy in the Adriatic, and of the British Fleet in the North Sea. Scapa Flow, like Taranto, was at the extreme end of the field of operations, and both bases afforded, in the Flow and the Mar Grande, a submarine and mine-proof shelter of sufficient extension for the ships and divisions carrying out their target practice and exercises. Brindisi and Rosyth were both bases for fast cruiser forces nearer to the enemy than the main bases, and finally both Harwich and Venice harboured the light detachments of the two fleets.

In the Otranto Channel we were confronted with a task in many respects similar to that which fell to the patrols in the Straits of Dover. The width of the Otranto barrage, however, being three times that of Dover Straits, and the depth of water being prohibitive for mining work, the operations against the submarines were there more complicated and difficult.

Dalmatia. Enemy advantages.

The unwillingness to face a fleet action was more or less equal in the German and Austrian High Commands, but the far greater distances between the bases in the North Sea gave opportunities to the British Fleet, in the battles of the Dogger Bank and Jutland, which could not be expected in the Adriatic. The deep and narrow channels running all along Dalmatia afforded a better protection than any minefield to the enemy's communication between Pola and his southern ports. Numerous gaps along this long naval trench allowed him the choice of the most convenient point from which to reach within a few hours the opposite Italian coast. Capital ships, or even light cruisers, watching these gaps, would have fallen an easy prey to the mine and torpedo, and early in the war the Amalfi, during a cruise, and the Garibaldi, during offensive coastal operations, were lost.

During the last months of 1915, at the request of the Allies, our Navy undertook the heavy task of transporting oversea munitions and supplies of all kinds for the Serbian Army, then retreating, and hardly pressed by the Austrians. The precarious lines of communication ended at the Albanian ports of Medua and Durazzo, which, being unprovided with permanent harbour works of any sort, were open to the full force of the winter storms. The work had, therefore, to be carried out practically on the open beaches. It was energetically

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pushed forward without interruption, and several thousand tons of stores were landed.

Evacuation of the Serbian Army.

The problem of supply became soon involved with one of far greater moment with the rapid advance of the Austrian Army. The necessity arose for the evacuation oversea of the remnants of our Serbian Allies, if they were to be saved from an early and inevitable surrender. The enterprise was successfully and swiftly carried out, and I believe that the experience gained by war and merchant ships in the great landings in Libia a few years before was of great value. The embarkation operations at Durazzo were almost continually carried out under fire, and the water was shallow, permitting only the use of small-sized vessels. The ravages of typhus, dysentery and cholera, were great, and, while adding to the difficulty, called for great devotion to duty on the part of the Medical Staff of the Army and Navy, and indeed from all connected with this great work of mercy.

Between January and February we successfully transported, with the assistance of the French, from Durazzo and Valona to Corfu 173,000 men (of whom 23,000 were Austrian prisoners), 11,000 refugees, wounded and sick, 10,000 horses, and much war material, the shipping required being thirty-six transports, nineteen of these being Italian. The Italian troops were shortly afterwards also successfully withdrawn.

Otranto barrage.

The character of the war in the middle and southern Adriatic was mainly determined by the great importance to the enemy of keeping the Otranto channel open for his submarines plying to and from the Mediterranean, while it was vital for the Allies to stop them before their exit from the Adriatic. A surface barrage was therefore formed in the channel with British drifters, supported by light cruisers and destroyers. When out on patrol, the drifters trailed astern a long light net, many feet deep. This net was carried away when a submerged submarine crossed the wake of the drifter, and its position was thus shown by a buoy connected with a net. The submarine would then be attacked with depth charges dropped from the drifters or other craft. This system of hunting was abandoned later in the war, when more complete and efficient means against the U-boats were found.

Attacks on the drifters.

The drifters were attacked in July, 1916, by Austrian light cruisers, when two of them were sunk, and again in December, 1916. In the night of May 5, 1917, a very determined attack was made by the light cruisers, Novara, Saida, and Helgoland, and fourteen drifters were sunk. The splendid behaviour of the officers and men on this occasion is already well known, and will always testify to the

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courage of the British fishermen in war. The Austrian raiders were faster than the majority of our vessels, while the distances to be run from the barrage, and from Brindisi towards Cattaro, were more or less equal. The encounters, therefore, always ended in running fights, and while the enemy had more than once a narrow escape, with various units seriously damaged, they always succeeded in bringing their units into Cattaro.

Coast attacks.

We had six attacks on the coast in 1915, three in 1916, one in 1917, and none in 1918. The rapid decline in the number of such attacks was due to the very effective measures taken by the Navy. Coastal batteries, which became numerous enough to cross, in most places, each other's fire, were erected as fast as guns could be provided, and were supplemented by a very complete organisation of armoured trains, armed with 3-in., 4·7-in., and 6-in. guns. These trains, which had proved very useful early in the war to the Allies in Flanders, were found invaluable for the defence of our long coasts.

French, British and Italian submarines have nobly fulfilled their task of watching and patrolling the intricate waters of the opposite enemy coast; the work was risky on account of the many minefields sown by the enemy, and also because the clearness of the atmosphere and the transparence of the water revealed the boats at a great distance if they approached on the surface, while the aircraft could detect them at considerable depth when submerged. Several successes were scored by the Allied submarines against enemy submarines, transports and destroyers.

Motor-boats.

In the Adriatic, however, the smaller distances and more favourable weather conditions contributed to the rapid evolution of a very efficient weapon for the war of ambush and surprise which geographical and other conditions forced upon us—I mean the small and fast motor-boat. It is to the credit of Admiral Thaon di Revel, Chief of Staff and Commander-in-Chief of the Italian Fleet during the last two years of the war, that he fostered the multiplication of these most useful little boats, and manned them with a well-trained *personnel* commanded by daring officers.

Initially the motor-boats were built only for anti-submarine purposes and for patrolling the coastal routes followed by trade; they were comparatively slow in speed and armed with a 3-in. gun and depth charges. A great advance for converting them into offensive boats was made towards the end of 1916 by supplying them with noiseless electric motors giving a speed of about 4 knots, supplied by a battery which would last for about four hours. When entering enemy ports only the electric power was used, and by their

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smallness the boats escaped detection even when swept over at night by powerful searchlights.

The motor-boats were built of wood, their length was about 42 ft., and they were completely decked; in practice, although displacing only about 12 tons, they proved to be able to stand rough weather just as well as torpedo-boats. The offensive type was armed with one 18-in. torpedo on each side, and three machine guns. Towards the end of the war we had a handy fleet of about 400 motor-boats, all supplied by various Italian firms, except a few of the Elco American type. The maximum speed of those employed during the war was about 24 knots, the latest boats being a few knots faster.

Special schools were formed for the training of the *personnel*, and the pilots were mostly taken from the masters of merchantmen. The M.A.S. (Motor-boat Anti-submarine Service) was organised in flotillas of 50 or 60 units, each commanded by a Senior Naval Officer. During the war they were always sent to hunt in pairs, in time to arrive by the fall of night at their watch-keeping positions on the several routes frequented from Pola, Cattaro, Durazzo, and the Islands, where they worked until shortly before dawn. This service went on for months without any attempt at interference by the enemy.

Raids on Trieste and Durazzo.

The first Italian raid of importance against the enemy ports was carried out on May 29, 1916, when torpedo-boat No. 24 entered Trieste shortly after midnight, and fired two torpedoes against a steamer anchored in the harbour. Both missed the target, but one exploded against a coal dépot, causing very serious damage. A few days later, in the night of June 7th, the M.A.S., Nos. 5 and 7, succeeded in penetrating the net defences of Durazzo, and torpedoing a steamer laden with supplies for the Austrian army in Albania. There is not space to recite all the deeds of gallantry of the Italian officers who entered the enemy ports.

Co-operation with the Army.

During the days which followed Caporetto, to the Navy fell the task of evacuating the coast from Grado and Monfalcone, so as to keep in line with the retreat of the Third Army. Much valuable war material and stores had to be carried away quickly by land and sea to prevent their falling into the hands of the enemy. During these trying days, before the resistance on the Piave had stiffened, the possibility of the worst had to be faced, and precautions to be taken in case a further retreat had become necessary. Venice prepared for the eventuality of a siege by land and sea, and the Navy took an important share in preparing new defensive lines further south. The two British monitors (the Peterborough and Picton) remained at Venice during those days of danger. From

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the lagoon they continually shelled the enemy lines, and helped in the evacuation of Grado. At the end of 1917 the work of the Navy was, more than ever before, combined with that of the Army in defending the country from invasion. Already, in the first two years of the war, several hundreds of guns of all calibres had been taken from the older ships, of limited military value, and mounted in monitors and craft of various kinds. Manned by our gunners, this Naval group operated in this marshy zone on the extreme right of our front, moving their artillery through the canals, and giving a good deal of trouble to the enemy. The defence of the lower Piave zone was entrusted to the stout troops of the Naval Brigade, who had heroically carried out the retreat from Monfalcone to the Piave without losing a single gun. However, in a few days the Naval troops were brought up to 7000, and about 800 guns of all calibres were rushed up the canals to the front lines, 200 or 300 yards from the enemy, with a central station, not far from the Lido, commanding all this ring of fire. The defence was completed by several battalions of bluejackets, who, for many months, stuck indomitably to their wet ground of the marshes.

Rizzo's successful blow in torpedoing the Wien at Trieste on the night of December 9, 1917, produced a deep impression in the Austrian Navy; several officers were court-martialled, and many trials started for suspicion of espionage and intelligence with our people.

Methods of raiding Pola—the Cricket naval tank.

The next raid of importance took place in May, 1918. After the sinking of the Wien all the defences and barrages of the Austrian ports had been carefully and heavily reinforced. It was intended to enter Pola in order to strike at his capital ships. It was out of the question to attempt to cut a passage through the numerous and complicated obstructions revealed by a careful examination of the photographs taken by our aircraft. Something new had therefore to be thought out that could pass *over* and not *through* the obstructions. Several experiments were made, but in its final shape the boat built by the Italian firm S.V.A.N., under the direction of Naval Constructor General Pruneri, was as follows: The vessel was 36 ft. long and forward the keel rose very gradually and gently towards the bow. On each side of the deck, and all along the keel, ran, by means of cogwheels, two stout endless flexible chains, from which protruded, at short intervals, three rows of steel teeth several inches long. These chains could be set running by an electric motor of 30 H.P., and when attacking a barrage the toothed chains engaged with its floating parts, and raised first the bow and then the whole boat, which crawled over it, like a sort of Naval tank. Another motor of

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15 H.P., inside a tunnel, drove the propeller. The speed at sea was about 5 knots and the range of action about 20 miles. The boat carried two 18-in. torpedoes and was manned by three men. After six unsuccessful expeditions, in one of which the two boats used at the time had to be sunk outside Pola, Lieut.-Commander Pellegrini attempted on the night of May 13th to enter the harbour. The Cricket went over the three foremost obstructions, but failed in the end to clear the last line of floats. The attacker had been seen while passing the first line, and Pellegrini found himself under fire from the battleship Radetzky, which was moored some 300 yards away. He ordered the two torpedoes to be fired, but at that very moment a gun-shot severed the arm of the torpedo gunner, and immediately afterwards the three men were overpowered by the crew of an armed steamboat. The Cricket was sunk.

The new Otranto barrage.

Early in 1918 the Allies and the United States had decided to take the most effective measures furnished by the improved general situation and by new technical means, in order to reduce to the minimum the number of enemy submarines entering the Mediterranean, with their principal base of refitting and supply at Cattaro. A submerged and fixed barrage of heavy nets, supported by buoys, was laid down at the southern end of the Adriatic between Leuca and Fano, with the hearty co-operation of the British, French and Italian Navies. This submerged rampart was armed with mines and supplemented by a mobile barrage composed of several lines of submarines, destroyers, trawlers and sloops according to the plan prepared by the British Commander-in-Chief, Admiral the Hon. Sir S. A. Gough-Calthorpe. Part of these lines of patrols kept watch south of the line from Leuca to Fano, but most of them were to the north. The idea was that the U-boats leaving Cattaro would have to remain constantly under water while crossing the several lines of the mobile barrage, and would thus arrive, if nothing happened in the meantime, at the mouth of the Adriatic, having exhausted the limited capacity of their electric power necessary for submerged navigation. The British Admiralty supplied a strong force of destroyers and several other units as sloops and depôt ships, and the United States sent several flotillas of their submarine chasers. The system was in full swing towards the end of the spring 1918, causing very serious annoyance to the enemy. Their losses were increasing sensibly, and they had to reduce their submarine activity in the Mediterranean.

Austrian enterprise.

In May the German Government urged that energetic action should be taken by the Austrian Navy to break, if possible, the barrage, which was slowly strangling the operations of the sub-

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marines. The request found a willing response in the new men who had taken the direction of the Austrian Navy. Under the former Commander-in-Chief, Admiral Njegovan, disquieting acts of revolt had taken place in the Fleet, both at Pola and at Cattaro, where the red flag had been hoisted by some of the older ships, while the officers had been locked in their cabins by the mutinous crews. After this short-lived symptom of the dissolution, which was rampant in the whole country, the command of the Fleet had been given to Rear-Admiral Horthy de Nagybánya, a rich Hungarian nobleman, who was popular. A plan was prepared for the destruction by mines of the Otranto barrage, to be carried out by all the light forces of the Austrian Navy. It was also arranged that the Battle Squadron should proceed from Pola to Cattaro, so as to be ready to come out on the day of action, in support of the light forces, and to cover them from a certain attack by the Allied cruisers at Brindisi.

The Szent Istvan sunk.

On the morning of June 10th, the first sub-division (Viribus Unitis and Prinz Eugen, with many destroyers) was already nearing Cattaro. The second sub-division, including the Szent Istvan and the Tegetthoff, with ten destroyers, left Pola on the evening of the 9th, proceeding in line ahead in the early morning of the 10th, well clear to the westward of the Islands, with the intention to get inside the channels for navigation during the day, and to pass, in doing so, between Gruitza and Premuda. A section of two M.A.S., Nos. 15 and 21, led by Lieut.-Commander Rizzo, which had been cruising between Premuda and Gruitza, torpedoed and sank the Szent Istvan. The Austrian ships were thereupon hurriedly recalled to Pola, and their ships did not again leave port to fight.

The last operation of importance, carried out by the Italian and Allied Naval forces in the Adriatic, was the bombardment of Durazzo, which took place on October 2, 1918. It was undertaken by our division of armoured cruisers, of the Pisa Class, and the squadron of British and Italian light cruisers and scouts. Nearly all the French, Italian and British submarines, based on Brindisi, were out between Cattaro and Durazzo, and this was, I believe, the only operation at sea of importance in which detachments of all the four navies took part.

Viribus Unitis attacked at Pola.

I now come to the last act of the Austrian Naval tragedy. Quite independently, Major Rossetti, Naval Construction Corps, and Surgeon Sub-Lieut. Paolucci had both projected to enter Pola single-handed, and to reach one of the enemy battleships at their moorings. Rossetti had been working for a long time in secret at the apparatus, which was in the end adopted for the expedition, and which he intended to push along by swimming. It was shaped like a torpedo, the front

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part being composed of two detachable mines, each containing about 350 lb. of trotyl. The after part enclosed a little engine, actuated by compressed air, contained in a vessel at a high pressure and of sufficient capacity to propel the whole apparatus at slow speed for some hours. The mines could be promptly attached at any given depth to the skin of the ship, and internal clockwork fixed the time when the explosion would take place. When the engine was running, the operators could lie astride its body, and steer it by their arms. It was with this apparatus that the two gallant officers compassed the destruction of the Viribus Unitis. Had the war continued, other plans were in readiness for striking another and mightier blow at the Austrian Battle Fleet.

After accepting the Naval terms of the Armistice, which included the complete surrender of many ships, and the disarmament of the rest of the Fleet, on lines similar to those which were shortly afterwards imposed upon Germany, the dying Empire tried to escape the loss of the Fleet by handing it over to the Jugo-Slavs. The Allies have since taken the necessary steps to restore the enemy ships to their proper status under the conditions.

C. Rey Di Villarey,
Captain, Royal Italian Navy.

Japan.

Objects of the Japanese Fleets.

It was on August 23, 1914, that our Government declared war on Germany in the cause of justice and in fulfilment of the treaty obligations of the Anglo-Japanese Alliance.

On the outbreak of hostilities, the following German Naval Forces were concentrated in the Pacific, viz.:—

1. German Pacific Cruiser Squadron, under Rear-Admiral von Spee (consisting of Scharnhorst, Gneisenau, Nürnberg, Leipzig, and Dresden), the whereabouts of which were uncertain. It was believed that the squadron was cruising amongst the Marshall or Caroline Islands.

2. A minor Squadron (comprising gun-boats and destroyers, including the Austro-Hungarian cruiser Kaiserin Elizabeth) was at Tsingtau, the only German Naval Base in the Pacific.

From a strategical point of view, what we had before us at the time of the declaration of hostilities was—

1. Firstly, the capture of Tsingtau, and thus to render von Spee's Squadron homeless, and the destruction of the minor Squadron sheltering in the harbour;

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2. Secondly, to locate von Spee's Squadron and destroy it;

3. Thirdly, to protect the Allied trade routes.

The first task was mainly entrusted to Japan, with the assistance of some British Forces. The second rested mainly with Vice-Admiral Jerram, Commander-in-Chief British China Squadron, supported by Japanese, French, and Russian Forces, and in co-operation with the Royal Australian Squadron.

The third task was carried out by the respective countries, according to their own plans.

As is well known, the capture of Tsingtau was successfully accomplished within a period of 10 weeks, but the Japanese Navy was called upon to increase its vigilance owing to the large expanses of ocean in which von Spee's Squadron, as well as other German warships from several quarters, could operate, and thus threaten the trade routes and communications across the Pacific and Indian Oceans.

The capture of Tsingtau.

Immediately on the outbreak of war—August 23, 1914—the Second Squadron, under Vice-Admiral S. Kato (comprising the battleships Suwo, Iwami and Tango; the coast-defence ships Okinoshima and Mishima; the armoured cruisers Iwate, Tokiwa and Yakumo; and the light cruisers Chitose, Takachiho, Akitsushima and Tone; and three destroyer divisions) was ordered to blockade Tsingtau, while the First Squadron, under Vice-Admiral T. Kato (comprising four battleships, Settsu, Aki, Kawachi, and Satsuma; four cruisers, Yahagi, Hirato, Niitaka and Kasagi; and four destroyer divisions) was despatched to patrol the waters between the Yellow Sea and the northern part of the China Sea, protecting our troopships proceeding to Tsingtau, and at the same time safeguarding Allied trade routes.

August 27, 1914, was the date on which Vice-Admiral S. Kato, Commander-in-Chief of the Second Squadron, declared the blockade of Kiochau Bay. From that time the Squadron (including the British battleship Triumph and the destroyer Usk) kept a vigilant watch night and day, sweeping and clearing mines under the enemy's fire, in all conditions of weather, thus enabling Lieutenant-General Kamio to land his army for the siege of the forts of Tsingtau. Towards the end of September, as soon as the mines were cleared, the Squadron commenced the bombardment of the forts, with the object of distracting the enemy's fire from our Army, which was just then preparing for offensive operations. After the lapse of about a month, when the Army was entirely ready for a general attack, the Squadron joined in the bombardment, and finally on November 7th

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of the same year the enemy was forced to his knees. In these operations we destroyed all enemy ships in the port (consisting of the Austro-Hungarian cruiser Kaiserin Elizabeth, the German gunboats Cormoran, Iltis, Tiger, Luchs, and destroyer S 90), at the cost of the cruiser Takachiho, the destroyer Shirotaye, and torpedo-boat No. 33, torpedoed or mined.

Operations in the Indian Ocean.

On August 26, 1914, the armoured cruiser Ibuki and cruiser Shikuma, under Senior Captain K. Kato, were despatched to Singapore to join the British China Squadron under Vice-Admiral Jerram. At the commencement our object was to search for von Spee's Squadron, but no enemy ships could be found within the Java Sea or west of it.

On September 10th, the German cruiser Emden, which had slipped out from Tsingtau before our blockade was declared, made a sudden appearance in the Bay of Bengal and sank several British merchant vessels. At this period there was urgent need for escorting British troops from Australia and New Zealand proceeding to the Western Front. Accordingly, the armoured cruiser Ibuki was ordered to proceed to New Zealand to assist in the convoying of the troopships, while the Shikuma proceeded with all speed to the Bay of Bengal to co-operate with the British cruisers against the Emden. Dealing with the Emden, however, was a most difficult task, and we were thus compelled to send more cruisers to deal with this elusive raider, until a squadron, comprising the cruisers Tokiwa, Yakumo, Ibuki, Ikoma, Nisshin, Shikuma, Hirato, Yahagi, under the command of Vice-Admiral S. Tochinai, was established in those waters early in November.

On the morning of November 9th, when a huge convoy from Australia and New Zealand, escorted by the Japanese cruiser Ibuki and two British cruisers, Melbourne and Sydney, was proceeding within reach of the Cocos Islands, the Emden was reported by the wireless station there, and the Sydney proceeded to put an end to the career of that notorious raider. Consequently, Admiral Tochinai's Squadron was practically disbanded, most of the ships being added to Vice-Admiral Yamaya's Squadron, then operating against von Spee, and other vessels were withdrawn to Home waters. The Ibuki, however, still remained on escort duties for the troopships as far as Aden.

Operations in the East Sea and China Sea.

At the outset of the war, our Third Squadron, under the command of Rear-Admiral M. Tsuchiya (consisting of some eight cruisers and gunboats) was despatched to patrol the stretch of waters extending from the southern part of the East Sea to the China Sea, with the object of protecting trade routes. This monotonous duty was

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faithfully performed until early in November, 1914, when Tsingtau fell and the Emden was destroyed.

About this period, owing to the withdrawal of British men-of-war from the East for the Western campaign, the whole task of patrolling this part of the ocean, as well as of watching the enemy colliers at Manila, was entrusted to Rear-Admiral Tsuchiya. In February, 1915, he proceeded to Singapore on the urgent request by wireless from Admiral Jerram, and directly despatched ashore landing parties to assist the British Forces in suppressing the rebellion. The landing forces from the French cruiser Montcalm and the Russian auxiliary cruiser Allior also participated in this work.

From that time up till the present our Squadrons, though many changes in commanders and units have taken place, bear the responsibility of patrolling the vast area of the China Sea, Java Sea, Batan Sea, Sulu Sea, Celebes Sea, and the northern part of the Indian Ocean, operating from Singapore as the base.

Operations in the Pacific.

About the middle of September, 1914, the First South-Bound Squadron (comprising two battle-cruisers (Kurama and Tsukuba), two cruisers (Asama and Iwate), and one destroyer division), under the command of Vice-Admiral T. Yamaya, was despatched to the Marshall and Caroline Islands to search for von Spee's Squadron.

In the early part of October another Squadron, designated the Second South-Bound Squadron (consisting of the battleship Satsuma and the light cruisers Yahagi and Hirato), under the command of Rear-Admiral T. Matsumura, was despatched with the same object in view. In the course of these operations, the Marshall and Caroline Islands were occupied by us in order to deprive the enemy of his base.

About the end of October it became apparent that no enemy vessels were to be found in those waters, and since von Spee's appearance off Samoa and Tahiti, the enemy's whereabouts were believed to be further southward. Hence a grand plan was projected between the British and Japanese Naval General Staffs to locate von Spee's Squadron from three directions; from the south by the British Squadrons coming from South America, from the north by the Allied Fleets starting from North America, and from the north-west by a Japanese Squadron under Vice-Admiral Yamaya, operating from Fiji.

These operations were successful in chasing von Spee from the South Pacific to the Falkland Islands, where he was totally defeated by Admiral Sturdee on December 8, 1914, the Dresden being the only vessel which escaped.

After the destruction of von Spee's Squadron, as our forces in this quarter were very much reduced, it was necessary to despatch some

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cruisers from time to time to deal with the Dresden and other German raiders. Since that time practically the whole of the Pacific, north and south, has been safeguarded by the Japanese Navy.

The western coast of America.

In August, 1914, two German cruisers were reported to be on the west coast of North America, while no British men-of-war were present there excepting the Canadian sloop Rainbow. This exposed our trade routes, both British and Japanese, to attack. To the Japanese cruiser Idzumo, then in Mexican waters, fell the duty of proceeding to Esquimalt, Canada, to safeguard those waters. The Newcastle arrived shortly afterwards to join the Idzumo and Rainbow.

These three vessels were insufficient to deal with von Spee's Squadron, and accordingly two more Japanese warships, the battle-ship Hizen and armoured cruiser Asama, were detailed for service there, and, while en route, were obliged to lie off Honolulu to watch the German gun-boat Geier. After the Geier, which was interned ultimately on November 7th, was disposed of, these two ships proceeded to Mexican waters to join the Idzumo and New-castle, and later on all these forces were put under the command of Rear-Admiral Moriyama. About this time the Australian battle-cruiser Australia joined these forces to locate the German Squadron, which was supposed to be cruising off the West coast of South America. This detachment formed part of the grand operations already mentioned, organised from three directions.

At the beginning of 1915, the cruisers Tokiwa and Chitose, under Vice-Admiral S. Tochinai, were despatched to this quarter to replace the forces under Admiral Moriyama. On March 10th of the same year, the Prinz Eitel Friedrich, a German auxiliary cruiser, was disarmed in an American port, and four days later the Dresden was sunk by the British Forces at Juan Fernandez off Chile. After several months' anxious watching, all the Japanese forces were with-drawn from those waters.

The Mediter-ranean.

The prolongation of the war and the stubbornness of Germany's resistance, necessitated our sending naval forces as far as the Mediterranean. In February, 1917, a Japanese Squadron comprising a cruiser and three destroyer divisions, under the command of Rear-Admiral K. Sato, started for the Mediterranean.

Allied naval operations in the Mediterranean were divided into three main spheres :—

1. The blockade of the Austro-Hungarian forces in the Adriatic.
2. The blockade of the Turkish forces and the Dardanelles.
3. The protection of Allied transports and merchantmen from submarine attack, and the taking of adequate measures for the destruction of these pests.

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The third task was that in which the forces of Rear-Admiral Sato participated during the hardest days for nearly two years. The number of vessels escorted by our forces in the Mediterranean is as follows :—

1. Warships	21	
2. Transports and merchant ships . . .	623	British
" " " " . . .	100	French
" " " " . . .	18	Italian
" " " " . . .	26	others
Total	788	

Three-quarters of the above vessels were troopships conveying troops. The number of troops thus convoyed amounted to 800,000.

Operations in Siberian waters.

The break up of Russia and the tyranny of the Bolshevists, backed by German and Austrian prisoners, compelled us to send naval forces, consisting of the Asahi and Iwami and an auxiliary ship, under the command of Rear-Admiral Kanji Kato, in January, 1918, to Vladivostock. (Later on these were replaced by the Mikasa and Hizen with a destroyer division.) This force operating with the British and American forces was successful in protecting the Allied interests, and checking enemy action.

In August of the same year, when Japanese troops were sent to Siberia to assist the Czecho-Slovaks, the whole of the Third Japanese Squadron, under Vice-Admiral Arima, consisting of two battleships, Katori and Kashima, two cruisers, Aso and Chihaya, and two destroyer divisions, together with a naval wireless corps, was despatched to support the Army.

I have given merely an outline of our Navy's enormous contribution to the successful conclusion of this great war. It will be seen that the Japanese Navy participated in the safeguarding of the seas from German violence over almost the whole world, excepting the North Sea and the Atlantic Ocean. It may be felt that something brilliant is wanting in the naval operations in this great war compared with the achievements in the Japanese-Russian War of 1904 and 1905, but anyone knowing the strategic situation will readily understand the positions, and in no way can a reflection be cast on the activities of the Navy. One has merely to remember the geographical position of Japan in its relations to the world war. The subjugation of Germany must be largely attributed to the unobtrusive but ever increasing pressure of the Allied Navies, which kept up a vigilant blockade and patrolled the world, absolutely erecting a strong barrier against all enemy trade and communications,

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while at the same time safeguarding those of the Allies in spite of the enemy's stubborn and persistent submarine campaign.

In conclusion, it may well be said that the final victory of the Allied cause was won by their absolute command of the Seas, in which the Japanese Navy can claim a fair share.

G. NAKASHIMA,
Commander, Imperial Japanese Navy.

THE UNITED STATES NAVY.

FOR nearly three years preceding the entry of the United States into the war against the Central Powers, the Allied Navies had succeeded in maintaining almost complete command of the sea's surface; and thus in securing for themselves great freedom of supply from the world's markets to their armies in Europe. At the time the United States declared war, April 7, 1917, Germany had embarked already upon her illegal intensive submarine campaign. The moment was very critical for the Allied cause—perhaps the most critical of the war. Shipping was being sunk at an alarming rate, so great that, if continued, adequate reinforcements and supply to armies on the continent, and provision of the civil populations of Great Britain, France and Italy, would have been impossible after so short a time as to render it certain for Germany to win the war. Furthermore, new construction of German submarines was proceeding at a much greater rate than their destruction; the *moral* of German submarine crews was high; and no solution to the problem of combating submarines had been evolved. In a word, German submarine power was on the eve of checkmating Allied naval surface power.

The United States Navy at this time consisted principally of a strong force of battleships, about fifty sea-going destroyers, forty-four submarines, and a few old cruisers. There was insufficient trained *personnel* available to man all ships.

Task of the American Fleet.

The problem confronting the American Fleet was to render the maximum possible support to the Allied naval forces in maintaining sea communications to western Europe. It was of the highest importance that this support be *timely*—a few months lost might lose the war. Owing to the great Allied preponderance in surface strength, as well as the peculiar character given to the war by the recent submarine campaign, a reinforcement of battleships (which constituted the backbone of the American Navy) was not imperative immediately, and would even prove an embarrassment, since tonnage for their support would be necessary at the expense of other more vital requirements. Cruisers were of limited use only, as guards against raiders. The number of submarines available for over-seas

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anti-submarine work, and their then problematical utility for such a purpose, seemed scarcely to warrant their employment abroad. The only force of much value which could be sent immediately was the Destroyer Flotilla.

Arrival of United States destroyers.

The extreme gravity of the situation was not well understood in the United States, but at the earnest solicitation of the then Rear-Admiral W. S. Sims, U.S. Navy, who had been sent to London to obtain information, the first group of destroyers arrived at Queenstown on May 3rd, and were ready for active service immediately after refuelling. These were the Wadsworth, Wainwright, Conyngham, Davis, McDougal, and Porter, under the command of Lieutenant-Commander J. K. Taussig, U.S. Navy.

By July 5th there were thirty-five destroyers based on Queenstown, and by November fifty-two destroyers were operating in European waters, distributed between Queenstown, Brest, and Gibraltar, five having come from the Philippine Islands. This force, together with twenty-seven yachts, which were sent during this period also, were employed almost exclusively upon convoy escort work in the submarine zone. It is not too much to say that the tide against the German submarine campaign, which was at its height when the earlier American reinforcements to the war-worn British anti-submarine craft arrived in British waters, could not have been turned without this force, except with the greatest difficulty. They made it possible to put into effect the convoy system of protecting merchant vessels, without reducing the already too small force of destroyers held with the Grand Fleet in readiness to engage the High Seas Fleet. With the introduction of the convoy system the losses in merchant tonnage decreased immediately to the point which made it possible to continue the war.

Convoy system.

The system of convoys required that merchant shipping be protected, not only in the submarine zone by destroyers and other small craft, but also in remoter areas where hostile surface raiders, and later submarine cruisers, might be encountered. For this purpose all American cruisers that were available were employed. The shortage of coal in Europe made it necessary for these cruisers to drop their convoys when their bunker fuel was reduced to that sufficient only for the return journey. The convoys were joined soon afterwards by the destroyers, so that the escort was practically continuous. American cruiser escorts were furnished to about 45 per cent. of all convoys in the Atlantic, including those bound north and south, as well as those sailing east and west.

American Battle Squadron.

In December, 1917, four American Dreadnoughts, Rear-Admiral Hugh Rodman commanding, arrived at Scapa Flow and joined the

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Grand Fleet. This force, which was increased to five ships soon after, was sent in order that there might be no question as to the preponderance of surface strength in favour of the Allies in the North Sea. The more favourable outlook of the tonnage situation, due to the continued success of the convoy system in keeping losses within reasonably safe bounds, made it possible to divert shipping for the supply of these ships; but since tank tonnage was particularly short at that time, and oil stocks in Great Britain were low, coal-burning Dreadnoughts were sent instead of the later and more powerful oil-burners. The American Squadron became an integral part of the Grand Fleet, taking its regular turn at escorting convoys to and from Norway, and performing duty similar in all respects to that of their British Fleet mates. Twice during the period subsequent to the arrival of the American Dreadnoughts the Grand Fleet put to sea, expecting to meet the enemy. On each of these occasions the American Squadron was present in its assigned position in the line of battle. It accompanied the Grand Fleet also when the surrender of the German battleships was received. A very high spirit of mutual respect and comradeship existed between these allied forces, and had a Fleet action been fought the Grand Fleet would have been proved as unified as if it had been all British or all American.

Arrival of U.S. submarines.

In consequence of the experience gained by the British in the use of their own submarines against German submarines, a force of eleven (later increased to twenty) American submarines was sent to European waters in the autumn of 1917. Of these seven were sent to Berehaven, the remainder being held at the Azores, where the United States had established a base. In their subsequent operations the Berehaven group sighted twenty-one hostile submarines, under conditions permitting four torpedo-shots by American submarines. One enemy torpedo fired at the U.S.S. L 2, recurved, hitting and destroying the ship from which it was fired. Probably the greatest value of these submarines lay in compelling the enemy frequently to operate submerged when it would have been more convenient to be on the surface, and in the effect on the enemy's *moral*.

This was practically all the assistance capable of being rendered immediately by the U.S. Navy as it existed when America entered the war. The national policy of scrupulous neutrality which had been observed previously had prevented the special preparations calculated to assist most in winning the cause to which the country had committed itself. Consequently, comprehensive measures of preparedness were undertaken immediately within the United States to combat the submarine effectively within the shortest possible

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time—for time was all-important. A system of coast-defence districts, comprising port organisations, patrol squadrons, mine-sweeping forces, coastal information service, and local anti-submarine craft, was established as a precaution against the enemy carrying the submarine war across the Atlantic. In consequence, when the German submarine cruisers appeared off the American coast during the latter part of the war, the coastal organisation was able to guard coastwise shipping and to insure that the more important Trans-atlantic traffic was not interfered with. All American merchant ships were armed and gun crews furnished. Supervision of the movements of the Merchant Marine was undertaken. A large transport service for carrying American troops was manned and operated by the Navy, including all interned and disabled German Transatlantic liners.

Increase of *personnel* required.

These activities, as well as others projected, required a large expansion of naval *personnel*. Since the United States had an almost negligible seafaring population, it was necessary to intitute a very large training service. All the existing shore training stations were expanded greatly, and practically all battleships were employed as training ships. During the course of the war the naval *personnel* was increased from about 85,000 to nearly 500,000, most of the accretion having to be trained while war activities were in progress.

Submarine chasers and Eagle boats.

One of the big measures undertaken was the building of merchant ships and placing them in operation. The Navy took no part in the building, but prepared to man and operate the ships as soon as completed. It was desired to combat the submarine offensively if possible. Construction work on battleships, battle-cruisers, and scouts was practically stopped, in order to concentrate on work upon destroyers. Plans were begun for the rapid building of about 200 destroyers in addition to the programme already in hand. A new type of submarine chaser of 80 tons was designed, and 350 were built, simultaneously with the development and manufacture of special devices for the detection of submarines by sound, with which the chasers were equipped. Later in the war 100 "Eagle" boats were ordered—a semi-destroyer of about 400 tons, designed specially for anti-submarine work. In addition to these measures a large naval air programme was begun, and extensive preparations were made to lay a mine barrage, in conjunction with the British Navy, across the North Sea from Scotland to Norway, in order to block access to the high sea for the enemy submarines.

The unexpectedly early termination of the war prevented the complete development of most of these measures, but nevertheless they exerted a considerable influence upon the naval campaign, and

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contributed materially to the Allied victory. It has since been learned that all of these measures were well known to the enemy.

Destroyers.

When hostilities ceased thirty-three new destroyers had joined the Flotilla in Europe. A total of seventy American destroyers were then operating from bases at Queenstown, Brest, Gibraltar, and the Azores, engaged exclusively, together with twenty-five yachts, in furnishing escort to convoys in the war zone. The Queenstown force served under the command of Admiral Bayly, Royal Navy. From the two principal bases, Queenstown and Brest, escorts were furnished to 710 convoys, aggregating over 7000 ships, and to more than 600 additional ships sailing singly. American escort was furnished through the war zone to about 62 per cent. of the whole American Army Expeditionary Force—without the loss of a single soldier by enemy action. The arduous nature of this service was accentuated by the necessity of using destroyers in the war zone to train nucleus crews for new destroyers completing at home. Repeatedly destroyers had to send home the best qualified officers and men, representing about 25 per cent. of the crew, receiving in their place practically green *personnel*; the first arrivals suffering most in this respect. During the year and a half of war 105 nucleus crews were sent home from a force averaging about fifty destroyers.

The convoy system and the submarine.

The initiation of the convoy system caused the German submarines at first to devote their principal attention to ships sailing singly. As the convoy system was extended to include practically all ships navigating the war zone, the submarine became more bold and developed tactics of attack against convoys. This gave the escorting destroyers the much-desired opportunity for transforming their *role* from the defensive to the offensive, by undertaking a vigorous counter-attack. The Americans took a leading part in developing such tactics, which included the so-called "barrage system" of using depth charges—that is, the laying of a large number of depth charges in rapid succession while the destroyer was proceeding at good speed. When the value of this system became apparent destroyers were equipped to carry thirty or more depth charges, instead of but four.

It was desired constantly to employ a part of the destroyer force exclusively in hunting and other purely offensive anti-submarine work, but the urgent requirements of convoy-escort work would not permit. Consequently, the American "bag" of submarines was less than if more offensive operations could have been undertaken. Out of about 150 encounters with enemy submarines, American destroyers and yachts are officially credited with having sunk two, probably seriously damaged three, and possibly damaged sixteen. Since the

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Armistice it has become known that the enemy losses were greater than was officially supposed by the Allies, and therefore it is reasonable to suppose that the American success was greater than is indicated above. The noteworthy casualties to destroyers and yachts employed in escort work were as follows:—Two torpedoed and sunk, one torpedoed and seriously damaged, two sunk in collision, two seriously damaged in collision.

Submarine chasers.

The first fifty chasers completed were allocated to the French Navy. The next thirty-six were despatched *via* the Azores, attacking two submarines en route, to Corfu, to reinforce the Allied mobile barrage being maintained against the passage of enemy submarines through the Otranto Straits. They arrived at Corfu in June, 1918. The next sixty-six chasers were distributed between Plymouth and Queenstown, arriving in detachments between May and August, 1918. The last eighteen, which brought the total in Europe to 120, arrived at Gibraltar in November, to operate against German submarines returning home from the Adriatic on account of the armistice with Austria. These chasers were employed in offensive work only. They were equipped with listening devices, the efficient use of which necessitated isolation from other types of vessels in order to avoid sound interferences. Their light battery, one 3-in. gun, required them to operate in groups for mutual support in the event of enemy submarines engaging with guns. If proper tactics were employed, operations by small groups facilitated hunting by sound, and the final attack with depth charges.

Difficulties of manning.

Owing to other requirements for trained *personnel* it had been impossible to man these craft with any but exceedingly inexperienced officers and men. With very few exceptions none had ever been to sea before starting their trip across the Atlantic, or had any knowledge of naval tactics. The first few months of their service in Europe could be little more than a period of training and tactical development, and only the earlier arrivals had begun to be efficient when the armistice was declared. Consequently, it is not surprising that the results obtained by the chaser effort were not greater. Forty-eight sound contacts with submarines and twenty-four sightings were made in the course of all chaser operations, nearly 400 depth charges being expended in attacks. Conclusive evidence of destruction of submarines is difficult to establish, particularly in the deep waters of the Adriatic. It is probable that two, and possible that four submarines were sunk by chasers in the Adriatic region, and there is a possibility of one having been sunk off Land's End. A detachment of the Corfu group of chasers participated in the bombardment of Durazzo by British and Italian cruisers, and performed

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valuable service in protecting those vessels from submarine attacks. The Italian General Staff credited the chasers with having sunk two enemy submarines during this bombardment, the Commander of the British Adriatic force crediting them with probably sinking one.

Mining.

Proposals to block the northern exit from the North Sea against the passage of submarines had been made early in the war by both naval officers and writers in the public press. Obviously a northern barrage would be useless unless the more convenient exit through the Dover Strait was also blocked. The latter problem had occupied the British Navy since 1914, and when the United States declared war, the difficulties at Dover (strong currents, great rise and fall of tide, the frequency of bad weather and heavy seas, and the peculiar characteristics of the bottom) had so far frustrated all efforts to prevent submarines passing. About this time new plans for blocking Dover, which included a combination of sub-surface mine fields with a dense surface patrol, gave sufficient promise of success to warrant consideration of a northern barrage. The project was a vast one. The distance across from Scotland to Norway was about 250 sea miles, and to guard against submerged passage the barrage would have to extend from the surface to a depth of about 200 ft. The depth of water averaged nearly 400 ft. through the greater part of the length, while in one gap of 50 miles the depth of water averaged about 900 ft.; so that the requirements alone for wire rope for mine moorings were huge, and could be filled in sufficient time only with the greatest difficulty.

The number of mines of the ordinary type which would be necessary to impose a reasonable risk against passage was practically prohibitive in view of the requirements at Dover and elsewhere.

New type mines.

The United States Naval Bureau of Ordnance was then engaged in the design of an entirely new type of mine, which, if successful, would cut the number of mines required and also the amount of wire rope to one-third of the ordinary figures. This would render it possible to lay a mining project on the scale proposed; but if the barrage was to be completed in time to influence materially the submarine campaign, the usual conservative method of building a few mines for experimental and development purposes before manufacturing in large numbers would have to be foregone.

The northern barrage.

Under these circumstances agreement between the British and American Navies was reached in November, 1917, to lay jointly the northern barrage. The United States placed orders immediately for 100,000 mines, manufacture to proceed simultaneously with the completion of the design. At the same time two large mine bases, for

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assembly and testing, were begun in Scotland; arrangements were made for the allocation of twenty-four steamers for the exclusive service of transporting mine material to the Scotland bases; and work was begun upon the conversion of eight large fast steamers into mine layers.

The first American mine-laying excursion was completed, under the protection of vessels from the Grand Fleet, on June 8, 1918; 3385 mines were laid in 3½ hours. Thereafter laying operations were repeated regularly, as soon as the layers could be reloaded and escort furnished, until the Armistice was signed, when the barrage was not quite complete.

The Americans laid a total of 56,570 mines, which was 80 per cent. of all laid in the northern barrage. The best performance was the laying of 5520 mines in 3 hours and 50 minutes, which is unquestionably a feat unparalleled in the annals of mining. There were no casualties during any part of the whole project, except the sinking of one mine carrier by an enemy submarine. There were a few delays due to faults in and the non-delivery of material, and to awaiting escort.

Effect upon the enemy.

It was ascertained from prisoners and other sources that the German submarine *personnel* feared mine-fields more than any other anti-submarine measure. The influence of this barrage upon their *moral* therefore must have been great, and undoubtedly contributed materially to the diminished submarine success towards the latter part of the war. The best evidence indicates that six German submarines were destroyed or seriously damaged in the northern barrage, and that a number of others were diverted or turned back by it, notwithstanding that it was only partially completed and that it was not patrolled. Undoubtedly, had the war continued long enough to permit its completion, and the contemplated patrols instituted to prevent the submarines from picking their way by daylight through the buoys just under the surface, this barrage, together with that at Dover, would have caused the submarine campaign to collapse completely, except for operations in the North Sea itself and in the Mediterranean. At the close of hostilities plans proposed by the American Planning Section of Admiral Sims' staff were being carried out for the establishment of mine barrages across the Otranto Straits and across the Ægean Sea, which would have defeated similarly the submarine campaign in the Mediterranean. Owing to the great depth of water, nearly 3000 ft. in the Otranto Straits, specially designed mine moorings were required, but the problem of barraging the Ægean presented no special difficulties.

Naval aviation.

When the United States entered the war her air strength was negligible. Development had to start with practically no trained

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personnel nor modern material. British experience clearly indicated that aircraft might be of very great value in combating submarines directly, as well as in assisting surface craft by giving information of the enemy's whereabouts. The American Navy therefore obtained priority over the Army in the delivery of material and undertook an extensive air programme, which contemplated taking over from the French the air patrol of the west coast of France, and rendering other practicable assistance to Great Britain, France, and Italy. The first contingent of *personnel* arrived at Bordeaux in June, 1917, being the first detachment of any branch of American forces to reach France.

Owing to the necessity of having to construct nearly all the buildings at stations selected, as well as to train *personnel* and await the delivery of planes and other material, the first year was practically one of preparation only, though many American pilots were employed on active service at French and British stations, flying in Allied machines. A total of eighteen stations were established ultimately in France, seven in Great Britain, and two in Italy, with an aggregate *personnel* of 15,000 officers and men.

Killingholme.

The largest project in Great Britain was that at Killingholme, designed originally for offensive work against German bases in the Heligoland region, for which Britain was to furnish fifty flying boats and the United States forty. Since the radius of the boats would not allow the whole trip to be made by air, it was planned to start the flight from specially designed lighters towed to sea by destroyers. On May 30, 1918, twenty-three flying boats and eight lighters, with *personnel* arrived at Killingholme from America, but the shortage of destroyers and difficulties with lighters compelled abandonment of this plan and the diversion of these air forces to anti-submarine work along the east coast of England, where submarines operated frequently. American planes from Killingholme escorted a total of 6234 merchant ships, patrolled nearly 60,000 miles, and made ten attacks on submarines, probably damaging two of them.

The American Northern bombing project in France was planned to operate against the enemy submarine bases in Flanders, under the command of Vice-Admiral Keyes, R.N. It was to be composed of eight squadrons of bombing planes, and was one of the largest bombing projects of the war. Delays in obtaining suitable machines prevented operations before the Armistice, notwithstanding complete readiness in other respects. Some of the *personnel* was utilised with British Bombing Squadrons pending arrival of machines for the American Squadrons.

The total American naval air effort resulted in thirty-nine attacks

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on submarines, and the dropping of about 80 tons of bombs in Belgium, besides patrolling, photographing, making reconnaissances, and participating in a few engagements with enemy aircraft. At the close of hostilities about 225 naval machines were in operation.

Battleship escort.

During the summer of 1918, when it became apparent that the submarine campaign could not prevent large American reinforcements and supplies from reaching France, and that eventual Allied victory on land under these conditions was practically assured, it was anticipated that Germany might despatch battle-cruisers or other strong surface forces to raid our sea communications. One powerful vessel falling in with a convoy, concentrated as they were, might do as much damage in a few hours as all the submarines usually maintained at sea were capable of within a month. To guard against this danger American battleships of the pre-Dreadnought type were detailed to escort troop convoys across the Atlantic, and three Dreadnoughts were sent to Ireland to provide additional protection according to a prearranged plan. Other Dreadnoughts were held in American waters in readiness for the same contingency.

Naval railway battery.

The longest range, and probably the most powerful guns on the Allied land front were five 14-in. naval guns mounted on railway carriages, supplied, manned, and operated by the U.S. Navy. The first shipment arrived at St. Nazaire on July 25, 1918, and the first gun arrived at the firing point thirty days later. The battery fired a total of 782 rounds at targets near the following places:—Longuyon, Mengiennes, Montmedy, Laon, Mortiers, Beny-Loisy, and Tergnier. The fire of these guns proved exceptionally accurate at longe ranges.

U.S. Army coal supply.

In the summer of 1917 the shortage of coal in France became a matter of grave concern to the American Army, which requested the Navy's aid in averting a crisis. At that time the Army were operating nineteen steamers from Cardiff to French ports, Cardiff being used as the source of supply on account of the short haul and the shortage in shipping. The Navy took over and operated all ships, and expanded the service ultimately to sixty-five colliers.

Oil pipeline.

On account of fuel-oil requirements for the Grand Fleet and the shortage of shipping, it was proposed in January, 1918, to lay an oil pipe-line from the Clyde to the Firth of Forth. This would make a somewhat shorter haul from the source of supply, and greatly reduce the distance to be navigated in highly dangerous waters. On March 9th, after consulting an American expert, Mr. F. M. Towl (who subsequently supervised the construction work), the Admiralty decided to lay the line, and requested that the work

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be done by the U.S. Navy. The pipe was to be 8 inches in diameter, and the whole installation capable of delivering 100 tons of fuel-oil per hour. The first consignment of materials arrived from the United States in time to begin work on the line on July 11th. On November 9th the completed line passed a successful test.

Self maintenance.

A noteworthy feature of the American naval effort during the war was the self maintenance of all forces notwithstanding that operations were being conducted from Transatlantic home bases. Except for dry-docking and some of the major casualties that had to be remedied, no demands were made upon the hard-pressed repair facilities of our European Allies. Practically all necessary supplies were sent from the United States, storage facilities being obtained at the European bases of the American forces. The ability to be self-sustaining in all essential respects has long been a policy in the American Navy, thus rendering possible this feature of American naval operations during the great war.

Co-operation with Allies.

American naval forces in Europe were under the command of Admiral W. S. Sims, U.S. Navy, who also represented the United States at all meetings of the Inter-Allied Naval Council. It was due to his wisdom that, from the beginning, the policy was adopted of utilizing American forces in the manner best calculated to bring victory to the Allies, and without regard to special interests. As new detachments arrived they were detailed to the work for which they were best suited, and assigned to the places where reinforcements were needed most. Frequently this practice involved the splitting up of American units and their serving under foreign command, and undoubtedly was detrimental to the efficiency of the United States Navy as an entity. But in order to serve best the then immediate major mission of prosecuting the war to the greatest advantage, questions pertaining to pride or selfish interest, such as command of detachments, allocation of forces and areas, authorship of plans and ideas, interchange of information and council —upon which rocks many Allied campaigns have been wrecked— deliberately were made subordinate by the Admiral. Admiral Sims attended the daily staff meetings at the Admiralty, and his staff worked in harmonious co-operation with the Admiralty Staff, in all its branches, including that pertaining to strategic planning. It is believed that this spirit of genuine co-operation resulted in the American naval aid being greater than would have been possible otherwise with twice the force.

G. S. KNOX,
Captain, United States Navy.

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U.S. NAVAL STATIONS AND BASES ESTABLISHED IN EUROPE :—

Great Britain	13
France	23
Mediterranean	6
Azores	1
Total	43

U.S.N. FORCES IN EUROPEAN WATERS AT THE CESSATION OF HOSTILITIES :—

Battleships	9
Destroyers	70
Cruisers and Gunboats	13
Yachts	27
Submarines	20
Submarine Chasers	120
Mine-sweepers	13
Mine-layers	9
Tugs	16
Cross-Channel Transports	4
Cardiff-France Colliers	55
Tenders and Repair Ships	18
Miscellaneous	9
Total ships	383
Officers	4,969
Men	75,742
Total *personnel*	80,711

Attacks on hostile submarines by U.S. Naval vessels	256
Enemy submarines probably damaged by U.S. Naval vessels	12
„ „ „ sunk „ „ „	5
Submarines probably damaged or sunk in Northern Mine Barrage	6
U.S.N. vessels (including troop transports) damaged	4
„ „ „ „ „ sunk	15

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CHAPTER III.

The Enemy Navies.

With the collapse of the German and Austro-Hungarian Empires and the fall of the Turk, the nations realised that the war had upset completely the balance in the compelling forces of the world. They saw three continents strewn with the wreckage of the broken Empires, and set about anxiously, through a League of Nations, with a vision of disarmament, to seek a new basis of equilibrium. The maritime situation of Great Britain and of the British Empire underwent a profound though indeterminate change. It was as if the compass had swung round under some potent new magnetic influence. The relative values were altered. The days when a former First Lord proposed a "naval holiday" seemed very remote. All the discussions of the past on standards of naval strength seemed dead. In the King's Speech at the opening of Parliament in February it was stated that "in order to reap the full fruits of victory, and to safeguard the peace of the world, an adequate Army must be maintained in the field," but no function was assigned to the Navy, nor perhaps, in that connection, could have been assigned. The primacy of the Sea Service appeared as if forgotten. The disturbing factor, of course, was that the German Navy, which had been the most significant thing in the recent history of the world, had disappeared. For a quarter of a century it had been the root, test and touchstone of British naval policy, and the fact that it went out of existence could not but have consequences for the British Navy which it was impossible to foresee. At the same time no one will dispute, whatever adversary may come, that by the sea we shall stand or fall. Upon that matter no argument is possible.

Surrender of the German Fleet.

There is no parallel in naval history for the surrender of the German High Seas Fleet to impotent internment and seizure at Scapa Flow, and to inevitable destruction or decay, nor to the giving up of the whole of the submarine flotilla with its salvage vessels. Grenville would not die without his fight in the Revenge. Drake, Hawke, Howe and Nelson never acted, and we think never could have acted, as the German officers acted when they brought their ships to the Forth. The surrender seemed strange and almost incredible. In some respects the German ships were better than our own. That had certainly been the case in 1916. Lord Jellicoe says that it was a rare thing for British capital ships

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mined or torpedoed, to survive, whereas the German ships, after being hit by more than one torpedo, were able to get back to port. The Seydlitz made a wonderful recovery after her battering by twenty-eight shells and one torpedo in the Jutland battle. The König, Grosser Kurfürst, Markgraf, and other ships were very badly injured, but all reached port and were quickly repaired, as well as the Ostfriesland, which went home with a large hole torn in her side by a mine.

The German officers in the High Seas Fleet were men of high scientific and professional attainments, and did not lack courage. They had acted with what seemed curious reticence and discretion throughout the war, but they were so circumstanced that they would run few risks. The dangers were too great. Lord Jellicoe has shown very clearly what they were. The Dogger Bank and Jutland battles were not of German seeking. In some respects German officers did certainly seem wanting in enterprise, but their passive attitude was almost certainly dictated by the policy of the German High Command. All the evidence that came to light after the Armistice was signed showed that the officers had been ready to strike a blow, that they were willing and even eager to fight a battle, but that the spirit of discouragement and mutiny had sunk so deeply into the minds of the men that they were powerless to overcome it. Let us not forget that in 1797 mutiny left Duncan with only two ships, during some months, to watch the Dutch at the Texel.

The German Fleet during the war.

There was a root of division in the German Fleet. The aristocratic officers who had crowded to the quarter-deck looked with ill-veiled contempt upon the officers of the Engineer branch, and the resulting situation was dangerous to the Fleet. The artificer class brought in the spirit of the big towns and the discontents of the workshops. Volunteering for the submarine service had come to an end, and the men were drafted to this duty as to any other. Great numbers of them never returned, and there was bitter discontent in the barracks and depôts, while parents deprived of their sons, and widows and orphans, made loud lament in the ports. The men did not habitually live in the ships, which were built not as places of habitation but as engines of war. They were housed in barracks or in accommodation hulks, and went on board merely for their duties. The ships' companies were raised by conscription, with all the weaknesses of that system for the manning of a fleet. The consequences were disastrous. Discipline weakened, discontent grew, and open way was made for the evil influences and social propaganda of the shore. A feeling of impotent discouragement also prevailed, arising from other causes. Captain Persius, whose animus against the German Naval Authorities

Internal situation of the High Seas Fleet.

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sometimes, it must be admitted, overbalanced his judgment, declared that for a year before the Armistice was signed practically no German High Seas Fleet existed. Be that as it may, it is a known fact that the Battle of Jutland had taken the heart out of the men. Lauded as a German victory, they saw each day more clearly thereafter that every movement made by their Fleet was fraught with peril. and pointed straight to disaster. The Fleet could not stir without the British Fleet knowing that it was on the move. The Germans were watched up to the very edge and in the intricacies of their own minefields. The sea sense, deepened in long weeks of cruising in storm, fog, peril and watchfulness, the steady discipline and unshaken nerve of the British Fleet, were against them.

Why the Fleet surrendered.

The Grand Fleet and the flotillas and patrols based on Dover, Harwich and other ports hemmed them in. One German officer confessed that the officers of the High Seas Fleet had endeavoured to trick the men into going to sea on the eve of the Armistice. How different was the spirit from that which existed when the splendid volunteers were mustered and trained for the attack upon Zeebrugge! Captain Persius alleged in the *Berliner Tageblatt* on November 18th that the German seamen of the lower deck "had been brought by bad handling at last into a state of despair!"

The surrender of the German Fleet was, therefore, a recognition of the inevitable. To fight a battle might have been heroic. There would have been great destruction and slaughter, the whole German Fleet would have disappeared, and the action would not have availed. It was a sad hour for the better class of German officers when the High Seas Fleet, the source and the expression of so much national pride, was surrendered, and no officer of any disciplined force could derive any satisfaction from the ignoble spectacle of the day.

Objects of German naval policy.

The High Seas Fleet had been built up by means of the most remarkable and successful campaign of propaganda that had ever been undertaken. Its object was explained with frankness by Admiral von Tirpitz when he introduced the supplementary programme of 1908 to the Budget Committee of the Reichstag. It was imperative, he said, giving point to the famous phrase in the preamble to the Navy Law of 1900, "that other Powers should realise that it was more advantageous to come to terms with Germany than to make war upon her." No nation had any wish to make war upon Germany. She had expanded her industries and her imports and exports under the shield of the British Navy, and could have continued to do so. But Germany was not content to depend for the safety of her foreign interests upon the good-will of the nations which sent her raw materials or received her manufactures. A certain

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consciousness of necessity seemed to drive Germany on. She was already the greatest Military Power, and now she was bearing a double burden, seeking to rival the greatest Sea Power also. Each addition to the Navy Law was enforced by masses of figures showing the movement of the German population, Germany's share in the total volume of foreign trade, the commerce of German ports, and German trade in foreign ports, shipping interests and shipbuilding, deep-sea fisheries, cables, and other subjects related to German commerce and over-sea trade, and foreign possessions.

Influences at work in German policy.

Germany was confronted with the greatest financial difficulties and dangers. Even at the very time when the addition of 1908 was made to the Navy Law, the deficit of Prussia was rapidly increasing. No attempt was made to cope with her obligations in the form of "matricular" contributions to the Empire, and it was estimated that £25,000,000 of new taxation would be required annually for the succeeding five years. It was imperative that production should be increased if stability was to be maintained. Yet the markets for German industrial products were extremely precarious, and dependent upon the commercial and economic policy of the States to which Germany exported her wares. There was also great apprehension of a possible curtailment of the supply of raw materials. Social discontent, which may be identified with what is now known as Bolshevism, was a growing peril to the State. Influences were at work, which, while assisting the development of German internal waterways, and of the vast extensions at Emden, aimed also either at a limitation of the importance or a securing of the advantages of Amsterdam and Antwerp, and finally of bringing Holland and Belgium within the orbit of the German Zollverein. Russia was a continual menace. A hidden ferment was at work which might yet lead, as it since has led, to the disruption of the Austro-Hungarian Empire. Italy was growing more and more weary in the shackles of the Triple Alliance. There was constant suspicion of the objects of British policy. We were charged with the purpose of encircling Germany, with the object of stifling her growing commerce, and darkening her place in the sun. Prince Bülow, in his capacity of Minister-President of the Prussian Diet, speaking on January 19, 1909, said: "We cannot and dare not save money at the cost of our readiness for battle and the peace of the country; our geographical situation is too unfavourable for that."

Thus it was that antagonism between England and Germany became an all-pervading reality and the central fact of the international situation, with its inevitable consequence of naval rivalry, and the growth of the Fleet which has now been crushed or destroyed.

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German Fleet and the submarine.

Whether the German Fleet, in its fall, will bring down the naval systems and groupings of the past cannot as yet be determined. The German submarine has signally failed. Yet Admiral Scheer—and he was only one among many German officers who expressed the same opinion—declared his conviction thus: "I have not a moment's doubt that we shall force England to negotiate yet, by means of our submarines." Such views were expressed almost up to the very eve of the surrender. It is certain that the Germans were working full blast at the building of submarines. When the Inter-Allied Naval Commission sent representatives to the German ports, it was discovered that something like 150 U-boats were in various stages of construction, which were to be surrendered or broken up. It was still believed that the submarine might prevail. Yet, if we are to credit writers like Captain Persius—the words are his own—"all these glad hopes were brought about by lies; lies, which were one of the chief weapons of our leaders on land and sea."

But, if the German Fleet does not shatter, by the outcome of its submarine efforts, the naval systems of former times, it has ended by shattering all the German idols and ideals of the recent past. The German Emperor, in his naval enthusiasm, appealed, on numberless occasions, alike to the legends of Valhalla, the glories of the Teutonic Knights, and the eager commercialism of the modern Fatherland. "Our future lies upon the water." "Bitter is the need of a strong German Fleet." "Each day shows us anew that the prosperous development of our country, without the protection of a powerful fleet, is unthinkable." Nowadays, very few people reflect upon these things. Herr Ebert, claiming for the ex-Kaiser the rights of a German citizen, was quite of a mind that he must be made amenable to justice. Count Rantzau, claiming the freedom of trade for Germany, the use of sea routes, and of coasts and ports, said he attributed relatively small importance to the rules of maritime warfare, and expressed no necessity and foreshadowed no proposal for the naval protection of German interests at sea.

Admiral von Tirpitz.

There was a time when Admiral von Tirpitz was bitterly attacked by the German Press, and the ex-Kaiser exclaimed; "I will not let them take my Tirpitz from me!" Yet, of all the exponents of German naval policy, no man has suffered so great a downfall as Admiral von Tirpitz. He was the real creator of the High Seas Fleet, in the sense that he created the public opinion which made the building of the Fleet possible, enlarged and extended the dockyards, and encouraged the development of the private shipbuilding yards, enforced the exact line of expansion, built the Fleet, created the new corps of officers, enlisted and organised the men, and gave shape,

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character, and driving power to the whole naval machine. It was a work for which there had been no parallel since the time of Colbert. The Admiral had a remarkable power of choosing his instruments, inspiring them with his ideas, making them think that what he wanted them to do was what they themselves wanted to do, and of swaying the whole of naval policy, which, as State Secretary of the Imperial Naval Department (Reichs-Marine-Amt), charged with the upkeep of the Navy, was not really his affair, in almost complete suppression of the Admiralty Staff (Admiralstab). He has lived to witness the utter collapse, downfall, and destruction of the mighty organisation, the creation of which was the work of his life. He always declared that he built the Fleet with no purpose of hostility towards England. He expressed this purpose, with emphasis, to the writer of the present chapter in 1913.

The attack on von Tirpitz.

Admiral von Tirpitz was attacked from two points of view. By some, his whole line of policy was denounced; by others, he was condemned for being obsessed with the magnitude of Dreadnoughts and big fleets, and of altogether neglecting the submarine. At a time when both Dreadnoughts and submarines have been surrendered, both these points of view merit some examination. It was the consistent policy of Bismarck, little as he liked England, to do nothing that would bring about serious misunderstanding with her. The policy of the German Empire for the past twenty-five years reversed the policy of Bismarck, to whom colonial adventures and naval ambitions were alike repugnant. A French admiral, some years ago, expressed a profound truth when he said; "L'océan ne comporte qu'un maître." But Germany offered a challenge to British sea power when she built the High Seas Fleet, and declared that it would be dangerous for England to cross her purposes. Many German thinkers discerned the danger, in the days before the war. It was not necessary to challenge England. Professor Hans Delbrück, in the *Preussische Jahrbücher*, denounced the "false naval policy" which went on building Dreadnought after Dreadnought, "rousing the suspicions of the English to a point of madness" instead of creating a great force of submarines. The seas were free to German commerce and would have continued to be free, if no High Seas Fleet had existed. The policy was disturbing to the equilibrium of European forces, and dangerous from the beginning. The conclusion can hardly be escaped that it started Germany headlong on her course down the perilous slope from which she ultimately plunged into disastrous war. This conviction was borne in upon the minds of many German thinkers, who before the war could gain no hearing, or dared not seek one, but who are now beginning to express their

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views. The sums which have been spent upon the German Navy are stupendous and incalculable. Herr Erzberger was reported to have estimated the value of the ships of war actually surrendered at £75,000,000. This figure is but a trifle compared with the whole capital outlay upon the Navy and its establishments. From Emden, Wilhelmshaven, and the costly position of Heligoland, which now, from a fortified naval base, will become a mere rocky islet in the sea, naval establishments are on all the coasts of the North Sea and Baltic to the eastern boundary of East Prussia. There are shipyards, dockyards, barracks, schools, torpedo factories, and countless other establishments, including the splendid cadet school for officers at Flensburg. There is no gainsaying the fact that all this has now proved futile and waste. If the modest naval ambitions of the time of Prince Adalbert had not been exceeded, Germany would never have indulged in the ambitions which at last plunged her into war.

Neglect of the submarine by von Tirpitz.

The attack upon Admiral von Tirpitz for his neglect of the submarine may seem strange to those who have been accustomed to see him described as the "arch-pirate." Even in 1904 and 1905 he had to defend his policy for its alleged failure to recognise the submarine. He declared that he would not check the building of the big fleet for the pursuit of a will-o'-the-wisp. In March, 1909, he exclaimed in the Budget Committee of the Reichstag, "How indignant would people be if the main feature of the German Navy were forty submarines, which were only of the value of scrap iron!" This attitude was continued up to the very outbreak of the war. In December, 1914, the Admiral confessed to the American correspondent, von Wiegand, that the naval authorities had "previously thought that the submarines could not remain longer than three days from their bases, as the men would become exhausted." He was a late convert to the use of the submarine.

Faith lost in the High Seas Fleet.

There is good ground for believing that long before the Battle of Jutland the German High Seas Fleet had surrendered its function, or had had its function surrendered for it by its administrative chiefs, who had ceased to regard it as an efficient fighting engine to enforce Germany's will. Towards the end of 1915 the Admiralty Staff, asserting their independence of the Imperial Navy Department, seriously considered the necessity and probable success of an unrestricted submarine campaign conducted against England, and prosecuted without any limitations of a political nature. In August of that year they discussed the question with a number of bankers, industrialists, and political economists. The result was the preparation of a secret Memorandum, the arguments in which conveyed the impression that the chiefs of the Admiralty Staff had already

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determined to prosecute the submarine war in unrestricted form, and that they hoped, by basing their contention on economic, and not on purely naval grounds, to convince the Emperor, the Imperial Chancellor and the diplomatists, of the certainty of favourable results in isolating and starving England. In all this argument the High Seas Fleet did not figure. Herr von Bethmann-Hollweg received the Memorandum in February, 1916, and asked Herr Helfferich, then Minister of Finance, to give his opinion on the proposals. The latter regarded the official findings as non-conclusive on economic grounds. There was no certainty that England would break down under the pressure, and the gravest doubt would exist as to the effect of naval ruthlessness upon neutrals, and especially upon the United States. Herr Helfferich regarded the remedy as of a desperate character. The original author of the Staff Memorandum replied, developing the argument that the internal situation of Germany was too serious to permit of half-measures. The war must be brought to an end, if national collapse was to be avoided, and with that object the sharpest weapons must be employed.

Views of the Admiralty Staff.

The Admiralty Staff supported their contention with the opinions of important authorities, to whom, however, they had presented the situation of the country as one of extreme danger. Herr Waldemar Müller, President of the Dresdner Bank, was all for unrestricted submarine warfare. Dr. Salomonsohn, of the Disconto-Gesellschaft, took a very serious view of the situation. He apprehended war with the United States, but so threatening was the internal situation of Germany that the risk must be run. It was imperative to end the war as soon as possible. He hazarded the conjecture that, even if the United States entered the war, the hostilities would be merely temporary, and the material needs of the two countries would soon outweigh any bitterness caused by the war. Dr. Paul Reusch, of Oberhausen, was equally resolute, and asserted that the world would respect only those who, in great crises of necessity, made use of their power without scruple, and Dr. Springorum, of Dortmund, concurred. Dr. Zuckschwerdt, of Magdeburg, warned any doubter that the nation would not stand by the Government if it yielded to the United States. Herren Benkenburg, of Hoerde, Schinkel, of Hamburg, Schmidt, of Platzhof, Engelhard, of Mannheim, and von Finck, of Munich, accepting the plea of the imperious needs of the situation, gave their support to the purposes of the Admiralty Staff. The authorities consulted represented finance, commerce, mining, industry and agriculture. No shipping magnate was consulted, and the Navy Staff called for the judgment of no representative of the Deutsche Bank. These omissions were significant. The shipping community

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were not in sympathy with the ruthless conduct of the war at sea, and Herr Helfferich had been a director, with Herr von Gwinner, of the Deutsche Bank, where the plans of the Admiralty Staff seem not to have been approved.

Everything staked on the U-boat.

The significance of these secret arguments and their relation to the surrender of the German Fleet is evident. The Admiralty Staff and the authorities consulted—who in many ways were representative—foresaw extreme danger, and believed that the internal situation of Germany was so perilous as ultimately to threaten the safety of the Throne and the Government. To them the revolution which put an end to the German Empire, and caused the fall of German kingdoms and principalities, followed by military collapse and the surrender of the Fleet, may have caused no great surprise. The Battle of Jutland was fought on May 31, 1916, but months before that time the German naval authorities had lost all faith in the High Seas Fleet as a decisive or potent factor in the war. They staked everything on the ruthless operations of the U-boats. They encouraged themselves in the hope that England would be brought to her knees within six months, anticipating that the revolution they dreaded would not intervene. The Government continued to function perhaps longer than they had dared to anticipate. In a double sense the submarine campaign operated towards the decay and surrender of the High Seas Fleet. The whole Fleet was discouraged by the attitude of the authorities towards it. They assigned little effective value to the Fleet, and placed all their hope instead upon the operation of the submarines. The submarine campaign also operated disastrously by deepening the detestation of the men for the service to which they were bound.

Ships surrendered.

The surrender brought to Scapa Flow the cream of the German High Seas Fleet. The rest might be described as "leather and prunella." The pre-Dreadnoughts were almost valueless, and lie disarmed in their ports. All of them are described as obsolete, and some of them have been used as accommodation or barrack ships for the men. The first four Dreadnoughts of the Nassau class, mounting 11-in. guns, were of little value, and had been dismantled. The Heligolands, with 12-in. guns, were more efficient. All the later Dreadnoughts, the five battleships of the Kaiser class, the Markgraf and her four sisters, the battle-cruisers Hindenburg, Derfflinger, Seydlitz, Moltke, and Von der Tann, came to Scapa Flow. The battle-cruiser Mackensen was not so far completed as to be ready to join the melancholy company of her impotent companions in internment. A considerable number of the German light cruisers have been sunk and otherwise destroyed during the war, and many others

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have become unserviceable; but all that possess any value have been surrendered for internment, like the battleships and battle-cruisers. The same is true of the destroyers. About seventy vessels of this class were sunk, blown up, or otherwise destroyed during the war, but large numbers have been built, many of the later ones displacing 1300 tons, and having a speed of 34 knots. Nearly all the best of these came with the bigger ships, or followed them, to the Forth, or were taken to Harwich or other ports. The submarines have been surrendered and divided among the Allies, and those which were under construction in German yards will all be broken up.

There is now a provisional plan, adopted by the Weimar Assembly, for the creation of a Republican Voluntary Fleet, on a democratic basis, apparently for police and other duties. The "Chief of the Admiralty," Rear-Admiral von Trotha, who commanded the battleship Kaiser, and was afterwards Chief of the Staff of the High Seas Fleet, exercises the powers formerly vested in the Kaiser, but subject to the control of the Minister of National Defence.

The Austrian Navy.

The Austro-Hungarian Fleet was in a different case from the German Fleet. It had not been built with any hostile purpose towards England. Mainly it had been directed against Italy. It had always been regarded as a small but efficient force. When the present writer was welcomed by Admiral Alois Edler von Kunsti on board the flagship Erzherzog Franz Ferdinand, at Pola, in 1912, he found the whole of the officers ardent admirers of our country and of the British Navy. They hoped that the Mediterranean Fleet would yet pay a visit to Pola. In a shady wood, not far from the splendid Roman amphitheatre, stood the statue of Admiral Tegetthoff, the victor of Lissa, and out in the harbour lay his flagship, the old Ferdinand Max, which in the battle had rammed and sunk the Italian flagship Re d'Italia. She was not maintained like the Victory at Portsmouth. It was thought that if held as the symbol of the triumph of 1866 she would give offence to the Italians, and it was understood, therefore, that she would be destroyed.

Disadvantages of the Austro-Hungarian Fleet.

The Fleet suffered from the polyglot character of the seamen, who were drawn from the various nations then comprised within the Dual Monarchy. The same difficulty existed in the Army, but the many races were grouped in armies, divisions, regiments, or battalions in the military organisation, whereas Germans, Croats, Slovenes, Czechs, and others were brought together in the companies of the ships. It was no uncommon thing for the accomplished officers of

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the Austro-Hungarian Navy to speak six or seven languages. Sometimes a man would be drafted to a ship whose tongue no officer understood, but such was the linguistic capacity of the officers that all difficulties soon disappeared.

Action of the Fleet during the war.

The Austro-Hungarian Navy did not enter the war under favourable circumstances. The great programme of expansion initiated by Count Montecuccoli had only made a beginning in the way of execution. Two battleships of the Viribus Unitis class had been completed, and two others were nearing completion. There were the three ships of the Franz Ferdinand class, but outside these the Fleet possessed little of fighting value. The light cruisers were insufficient in number. Eighteen destroyers, about fifty torpedo-boats, and a few submarines, built mostly at Trieste and Fiume, had a certain value, and considerable additions were made to the flotillas after the outbreak of the war, the strength being more than doubled. Many submarines came overland from Germany in sections, and were assembled at Trieste and Pola. With the development of the submarine campaign in the Mediterranean, German officers began to take a larger share in the organisation and the direction of affairs. But opposed to the Austro-Hungarian Fleet were the three powerful fleets of the Allies, and a sedentary strategy had been imposed upon the battle squadron at Pola, which rarely got under way. Raids were made on the Italian coast; such assistance as was possible was rendered in the operations on the coast of Albania, and use was made of the flotillas. Light cruisers and destroyers raided the allied drifter line, sinking eleven drifters, in May, 1917. There was fighting off Cattaro. At length a considerable enterprise was undertaken, and defeated by a very gallant action. Rizzo, in his motor-boat, attacked the Austrian battle squadron, and the Dreadnought Szent Istvan was torpedoed and sunk off Premuda Island, June 10, 1918. The ship was on her way from Pola to Cattaro, and a former officer of the Austrian Navy has stated that an important operation had been planned. She, with her three sisters, and a force of light cruisers, destroyers, and submarines, were to rendezvous at Cattaro. The Dreadnoughts, accompanied by a flotilla, were to seek action with the Allied forces north of Brindisi, while submarines awaited outside the port of Avlona, hoping to find opportunities, and a light force attacked the drifter line and other ships at the Otranto barrage. The sinking of the Szent Istvan upset the whole plan.

Jugo-Slavism and the Fleet.

There can be no question that the Jugo-Slav movement exercised a profound influence in the Fleet. It created political ferment among the men, and found sympathy on the quarter-deck. Very serious trouble arose at Pola and Cattaro. Towards the end of 1917

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Styrian, Croatian, Dalmatian, and Italian sailors became mutinous, and many officers were said to have been killed and others thrown overboard. The mutiny was suppressed with great severity. The Magyar and Slav elements mutinied in February, 1918, nearly every ship being affected. At Cattaro the 32nd Regiment refused to fire on the mutineers. Some demands were conceded; but the disaffection continued, and the dockyard workmen, both at Pola and Cattaro, rose. Admiral Njegovan, who had succeeded Admiral Haus in command, as well as other officers, was superseded. The Italian elements were expelled from the ships and naval establishments, and the mutiny did not diminish the willingness of the Fleet to fight the Italians. Probably many of the officers were not strongly affected towards the house of Hapsburg, though the Archduke Franz Ferdinand had been exceedingly popular with the Fleet. Not more than one-third of the officers bore Teutonic names, and probably not one-quarter among the younger officers. It appears that some retired officers went over to the Jugo-Slav Government at Agram before the fall of the Empire. Amongst these was Dragutin Prica, whose age was forty-seven at the outbreak of the war, and who had reached the rank of corvette-captain in November, 1907. He had been retired for a year with the rank of captain when the revolution gave him prominence, and then he appeared as Jugo-Slav Admiral and Minister of Marine. He had received the Military Service Cross and the War Medal, and had been decorated with the Russian Order of Anne. Officers on the active list also abandoned the Empire. The senior captain at Pola was Vucović de Podkapelski, who was about to be promoted to flag rank by the Emperor. The Agram Government made him a full admiral forthwith. Another officer, who is stated to have gone over to the Jugo-Slav Government, was Rear-Admiral Edler von Obradich-Bevilacqua Catinelli, Knight of the Order of Franz Josef.

Transfer of the Fleet to the Agram Government.

According to a statement made by the Jugo-Slav Admiral, Dragutin Prica, no mutiny occurred. He declared that what happened was a simple cession of the Austro-Hungarian Fleet to Jugo-Slavia negotiated by Imperial officials. The Italians, on the other hand, alleged that the Fleet was seized by the Jugo-Slavs, who possessed it only by "right of revolution" and as an act of hostility. The final destination of the Fleet will be settled by the Peace Conference. Admiral Dragutin Prica's statement was that on October 29th, the very day upon which the Austrian *parlementaires* appeared before the Italian lines to demand an armistice, the Emperor Charles and his Government telegraphed to the National Council of Agram making the gift to Jugo-Slavia of the whole Austro-Hungarian Fleet, and requesting the immediate dispatch of

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two delegates—one to Pola and the other to Cattaro—to receive officially from the hands of the Ministry the cession of the warships and forts. From Agram two delegates thereupon set out. The principal delegation, under the presidency of Dr. Tresitch-Pavitchitch, member of the National Council of Agram, proceeded to Pola, where on the morning of the 30th it met the Imperial Delegation from Vienna. The regular protocol having been drawn up and signed at 4 a.m., all the ships, said the Jugo-Slav Admiral, lowered the Austro-Hungarian flag, while the Viribus Unitis fired twenty-one guns as a salute to the flag which was then disappearing from the Adriatic. Shortly afterwards the same ship saluted, with another twenty-one guns, the Jugo-Slav flag, which was hoisted in all the vessels. A similar scene took place at Cattaro, where Rear-Admiral Catinelli had command.

A remarkable incident occurred on the next day, which manifested in practice the resentment of the Italians at the cession of the Fleet to Jugo-Slavia, or its seizure by the representatives of the Agram Government. At dawn two Italians stealthily entered the harbour of Pola, and blew up and destroyed the Viribus Unitis by means of a mine laid against her side.

The Jugo-Slav Admiral resented the general conduct of the Italians. Difficulties arose about the flag. "The Italian authorities said that we could fly at the mast-head the Jugo-Slav flag with an Italian flag beside it, but at the stern the Austro-Hungarian flag must still be flown. We refused. We did not want to see the Austro-Hungarian flag again. For some days the incident prevented any movement on the part of our Merchant Marine; then our ideas gained the day, and the ships recommenced navigating with a small white flag at the mast-head and a Jugo-Slav flag at the stern."

Such, therefore, was the end of the Austro-Hungarian Fleet. The bitter antagonism which arose between the Italians and the Jugo-Slavs on the question of the Adriatic created the most thorny question for the Peace Conference. With the settlement of the future of Trieste, Pola, Fiume, Sebenico, Cattaro and the Dalmatian Islands will go the destination of the ships and vessels of the late Austro-Hungarian Navy. The Allies could not recognise any naval settlement effected between the late Imperial Government and the Jugo-Slav Government established at Agram. Thus it was that on March 24th the late Austro-Hungarian Dreadnought battleship Tegetthoff, the Erzherzog Franz Ferdinand and the light cruiser Saida were taken over by the Italians, and arrived in the basin of St. Mark at Venice, flying the Italian flag, and escorted by a squadron under command of Admiral Cagni and the Prince of Udine.

JOHN LEYLAND.

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CHAPTER IV.

Comparative Strength.

A survey of the comparative strength of Navies might seem inappropriate at a time when the energies of the Peace Conference have been so largely concentrated on bringing about a League of Nations. But the League of Nations is not yet an accomplished fact, and it seems desirable that British citizens, whether of the Mother country or the Oversea Dominions, should know how the British Navy stands at the conclusion of the great struggle. It has therefore been decided again to prepare the Comparative Tables, which have been absent from the volumes of 1915 and 1916, accompanied by a few elucidatory notes.

The main facts which emerge from a comparison of relative Naval strength at the present time with that at the beginning of the war are, that the British Navy still holds its position, and that the United States Navy has become, after Great Britain, the second Naval Power of the world.

During the first two years of the war two remaining battleships of the Iron Duke class, the five Queen Elizabeths, and the five of the Royal Sovereign class, which were under construction in July, 1914, were completed, while the Agincourt and Erin, which were building in England for Turkey, and the Canada, which was being built for Chile, were taken over for the British Navy. Only one modern battleship, the Audacious, was lost during the war. Four were laid down, but the Howe, Rodney and Anson will not be continued, and only one, the Hood, is to be completed. She is now classified as a battle-cruiser.

For the French Navy, the France, Bretagne, Lorraine, and Provence were completed in 1915 and 1916. The construction of the battleships of the Normandie class was suspended. The Danton was the only modern battleship lost by the French Navy.

For Italy, the Andrea Doria, Caio Duilio and Conte di Cavour were completed in 1915. Four larger and more powerful battleships were laid down, but construction was not proceeded with after Italy's

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entry into the war. The concentration of the Allied Fleets in the Mediterranean rendered this unnecessary. The Leonardo da Vinci was sunk by internal explosion in Taranto harbour, but has been refloated and is to be repaired.

For the German Navy, the four battleships of the König class were completed in 1914 and 1915, and two battleships of the Baden class in 1916 and 1917. The other battleships of the latter class, the Sachsen, and Württemberg (Ersatz Kaiser Friedrich III.), laid down in 1914, and launched in 1916, and the Ersatz Kaiser Wilhelm der Grosse, which is in an earlier stage, will not be proceeded with.

The Austrian battleships Prinz Eugen and Szent Istvan were completed in 1914. The latter was torpedoed and sunk at sea, while the Viribus Unitis was sunk in harbour, as described in Chapter II. The Tegetthoff and Franz Ferdinand, with the light cruiser Saida, were taken over by Italy.

For the Russian Navy, the four battleships of the Poltava class and the Volya (ex-Alexander III.) were completed in 1915. The addition of the four of the Poltava class to the Baltic Fleet exercised considerable influence on German Naval dispositions in 1915 and 1916. The Volya was built for the Black Sea. The revolution, and the wholesale butchery of Naval officers, destroyed the value of the Russian Navy in the later stages of the war. No reliable information is available as to the present condition of Russian ships, either in the Baltic or in the Black Sea, but they are believed to be ineffective.

The United States Navy, as was to be expected, has made great strides during the war. For the first three years the normal programme of construction went on unchecked. The New York was completed in 1914; the Pennsylvania, Nevada and Oklahoma, in 1915–17; the Mississippi and New Mexico in 1918.

The Idaho has been commissioned, the Tennessee has recently been launched, and the California is well advanced. Ten other battleships were to be built under the three years' programme of August, 1916. Work upon them was practically suspended when the United States entered the war, except in the case of the Maryland and West Virginia. Some progress was made with the Colorado and Washington, but the remaining six battleships were not laid down. The Secretary of the Navy states that all battleship work will now proceed as fast as material and labour become available.

For the Japanese Navy four large battleships, the Fuso, Hyuga, Ise and Yamashiro, were completed in 1917 and 1918. The battleship Kawachi and the battle-cruiser Tsukuba were blown up. In

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June, 1918, a programme for building eight battleships by 1923 was approved by the Diet. Two battleships, the Mutsu and Nagato, are expected to be launched this summer.

The position of the principal Navies as regards modern battleships at the beginning and at the end of the war was as follows:—

	1914.			1919.		
	Built.	Building.	Total.	Built.	Building.	Total.
Britain	21	12	33	35	—	35
France	8	10	18	12	5	17
Italy	3	3	6	6	4	10
United States	9	5	14	17	6	23
Japan	3	1	4	7	2	9
Germany	13	6	19	19	2	21
Austria	2	2	4	2	—	2
Russia	2	7	9	8	—	8

In Great Britain no battleship is now progressing on the stocks. In France and Italy the construction of the ships not down as building has been suspended. The United States and Japan are the only countries where battleship construction is proceeding.

The eleven most powerful battleships of the German Navy, as well as five battle-cruisers, are interned at Scapa Flow.

Battle-cruisers.

For the British Navy, the Tiger, battle-cruiser, laid down in June, 1912, was completed in October, 1914. At the beginning of the war the battleships Renown and Repulse, of a slightly modified Royal Sovereign class, had been laid down, but at the close of 1914 orders were received to convert them into very fast battle-cruisers (32 knots), and to complete them within fifteen months, which period was not greatly exceeded. Three other cruisers, sometimes described as battle-cruisers, but lightly armoured, and officially denominated light cruisers, have been completed—Courageous, Glorious and Furious, but the last-named has been converted into a sea-plane carrier.

The battle-cruisers Queen Mary, Indefatigable and Invincible were sunk with nearly all hands in the Battle of Jutland.

Three powerful battle-cruisers, the Haruna, Hiyei and Kirishima, sister ships of the Kongo, built for the Japanese Navy at Barrow in 1913, have been completed during the war.

Six of the class are building for the United States Navy.

The four Russian battle-cruisers of the Borodino class, 32,000 tons displacement, were launched in 1915, but have not been completed.

Older battle-ships.

Older battleships do not exercise much influence on the relative strength of Navies. With the exception of the King Edward class,

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all the thirty-eight ships comprised in the lists of older battleships in 1914 have been struck off the list of the British Navy. Several were sunk in the war. In the French Navy only the five battleships of the Patrie class can be considered effective. Several of the older ships were lost in the war. In the Italian Navy, the Regina Margherita and Benedetto Brin were sunk, while the two Saint Bons are clearly ineffective.

Several of the German older battleships took part in the Jutland battle, and the Pommern was sunk. Battleships carrying a principal armament of 9·4-in. guns would be useless in modern warfare. The same may be said of the Austrian older battleships (with the exception of the three of the Radetzky class), and of the Russian older battleships; while of the United States older battleships some may still possess some military value, although they are not more powerful than our Edward VII. class, which will soon be struck off the British list.

Armoured cruisers.

Of the armoured or first-class cruiser class several were sunk during the war. No Power has any ships of this class under construction, unless the Glorious and Effingham could be so considered, and it seems probable that the class will gradually disappear from the lists of all Navies. Experience has shown that a type between the battle-cruiser and light cruiser is not of much value. Many armoured cruisers are retained in the following tables merely for comparative purposes, because like vessels have not been removed by other Powers from their own lists.

Light cruisers.

The light-cruiser class of good speed, developed first in Germany, and subsequently, with improved fighting qualities, in the British Navy, has proved of immense value during the war, whether as a screen to battle squadrons, as a commerce destroyer, or as a protection to trade. Apart from destroyers and small craft, British construction has been mainly concentrated on this type during the war, with the result that the British Navy in this respect is in a far better position at the end than it was at the beginning of the war. About forty light cruisers, with speeds of 28–30 knots, have been completed within the last four and a half years. We now possess some ninety of this useful type, in which most other Navies are very deficient. Without an adequate force of light cruisers the efficiency of battle squadrons is seriously diminished.

De-stroyers.

The immense value of destroyers as a protection to battle squadrons, as escorts to convoys, and as hunters of submarines, has been amply demonstrated during the war. At the battle of Jutland, as well as on other occasions, they showed their capacity to act offensively against battleships, and the gallantry of their crews was

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magnificent. A very large number of destroyers were built for the British Navy during the war. The flotilla leader type, of which the Swift was the pioneer, was considerably developed. With their high speed, and their armament of four to six 4-in. guns, they have proved a valuable addition to the Navy. In the destroyer classes we stand in an infinitely stronger position than we stood in at the beginning of the war.

The Comparative Tables, and the foregoing explanatory notes, afford satisfactory evidence that we have good reason to be gratified with the present strength of the British Navy, and that we can have every confidence that, for several years to come, the command of sea-communications, which is so vital to the existence of our widely scattered Empire, will be safe in its hands. The sea-power, of which the British Navy is the embodiment, has been the decisive factor in the victory of the Allies. Without the British Navy victory would have been impossible. Admiral Sims, on his arrival in the United States, expressed in noble terms the comradeship of the British and American Navies. "The American Navy has no delusions as to how the war was won, or by whom. Had it not been for British fighting ships, American fighting men never could have got across the sea in time." Mr. Daniels and others in high positions in the States have urged that the United States should aim at possessing the most powerful Navy in the world. This would imply the wresting from us of that command of the sea which we have held for many centuries and which we can justly claim has never been misused. If the American people so desired, there is little question that the object could be achieved. Mr. Daniels himself has explained that, in urging the policy he advocates, he is actuated by no hostility to this country. When he was in Paris, on March 26th, he made a statement regarding his Naval policy, in the course of which he corrected the very prevalent impression that America wants to deprive Great Britain of the Naval pre-eminence which she considers vital to the Empire's safety. He added that the United States fully realised the necessity of this pre-eminence to the British Empire. The spirit of comradeship established between the two countries during the war, and, above all, the cordial co-operation between the two Naval services, in which Admiral Sims played so prominent a part, should prevent any serious rivalry arising on this matter between the two great English-speaking races.

BRASSEY.

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TABLE I.—MODERN BATTLESHIPS.

GREAT BRITAIN.

Launched.	Name.	Displacement.
		tons.
1915	Royal Sovereign	25,750
1914	Royal Oak	
1915	Revenge	
1915	Resolution	
1916	Ramilies	
1915	Malaya	27,500
1914	Barham	
1913	Queen Elizabeth	
1913	Warspite	
1914	Valiant	
1912	Iron Duke	25,000
1912	Marlborough	
1913	Emperor of India	
1913	Benbow	
1913	Agincourt	27,500
1913	Canada	28,000
1913	Erin	22,940
1911	King George V.	23,000
1912	Ajax	
1911	Centurion	
1911	Conqueror	22,500
1911	Monarch	
1911	Thunderer	
1910	Orion	20,000
1910	Colossus	
1910	Hercules	
1909	Neptune	19,900
1908	Collingwood	19,250
1908	St. Vincent	
1907	Bellerophon	18,600
1907	Temeraire	
1907	Superb	
1906	Dreadnought	17,900
1906	Lord Nelson	16,500
1906	Agamemnon	

35 ships.

ITALY.

Launched.	Name.	Displacement.
		tons.
	Caracciolo	30,900
	Cristoforo Colombo	
	F. Morosini	28,000
	M. Colonna	
1913	Andrea Doria	23,562
1911	Caio Duilio	
1911	Conte di Cavour	22,023
1911	Giulio Cesare	
1911	Leonardo da Vinci	
1910	Dante Alighieri	19,400

10 ships.*

FRANCE.

Launched.	Name.	Displacement.
		tons.
	Béarn	25,230
	Languedoc	
	Flandre	
	Gascogne	
	Normandie	
1913	Bretagne	23,177
1913	Lorraine	
1913	Provence	
1912	France	
1912	Paris	23,100
1911	Courbet	
1911	Jean Bart	
1909	Condorcet	18,890
1909	Diderot	
1909	Mirabeau	
1910	Vergniaud	
1909	Voltaire	

17 ships.†

UNITED STATES.

Launched.	Name.	Displacement.
		tons.
	Washington	32,600
	West Virginia	
	California	32,300
1918	*Colorado*	32,600
1919	*Tennessee*	
	Maryland	
1917	Idaho	32,000
1916	Mississippi	
1916	New Mexico	
1915	Arizona	31,400
1915	Pennsylvania	
1914	Nevada	27,500
1914	Oklahoma	
1912	New York	27,000
1912	Texas	
1911	Wyoming	26,000
1911	Arkansas	
1910	Florida	21,825
1909	Utah	
1909	Delaware	20,400
1908	North Dakota	
1908	Michigan	16,000
1908	South Carolina	

23 ships.

JAPAN.

Launched.	Name.	Displacement.
		tons.
	Mutsu	32,000
	Nagato	
1914	Fuso	31,000
1915	Hyuga	
1916	Ise	
1915	Yamashiro	
1911	Settsu	20,800
1907	Aki	19,800
1906	Satsuma	19,350

9 ships.

RUSSIA.

Launched.	Name.	Displacement.
		tons.
1914	Volya§	22,500
1913	Ivan Grosnyi§	
1911	Sevastopol	23,000
1911	Petropavlovsk	
1911	Gangut	
1911	Poltava	
1907	Republika	17,400
1906	Andrei Pervozvannyi	

8 ships.

GERMANY.

Launched.	Name	Displacement.
		tons.
1916	*Sachsen*	29,000
	Württemberg	
1915	Baden	
1915	Bayern	
1914	Kronprinz	25,387
1913	GrosserKurfürst	
1913	Markgraf	
1913	König	
1911	Kaiserin	24,310
1912	König Albert	
1912	PrinzR. Luitpold	
1911	Friedrich der Grosse	
1911	Kaiser	22,500
1910	Oldenburg	
1909	Thüringen	
1909	Ostfriesland	
1909	Helgoland	18,600
1908	Posen	
1908	Rheinland	
1908	Nassau	
1908	Westfalen	

21 ships.‖

* Including four not progressing. † Including five not progressing. § Black Sea. The situation of all the Russian ships is uncertain.
‖ The two first-named are not likely to be completed; all the others down to the Oldenburg have been interned.

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TABLE II.—BATTLE-CRUISERS.

GREAT BRITAIN. Ld.	Name.	Tons.	UNITED STATES. Ld.	Name.	Tons.	JAPAN. Ld.	Name.	Tons.	RUSSIA. Ld.	Name.	Tons.	GERMANY. Ld.	Name.	Tons.
	Hood			*Constellation* ...		1916	Kirishima ...		1915	*Borodino*			*Mackensen* ...	†
1916	Renown	25,750		*Constitution* ...	35,000	1913	Kongo	27,500	1915	*Ismail*	32,200		Hindenburg ...	30,000
1916	Repulse			*Lexington* ...		1915	Haruna		1915	*Navarin*		1913	Derfflinger ...	
1913	Tiger	28,500		*Ranger*		1915	Hiyei		1915	*Kinburn*		1912	Seydlitz	24,640
1911	Princess Royal	26,350		*Saragota*								1910	Moltke	22,640
1910	Lion			*No.* 6...								1909	Von der Tann...	18,700
1911	New Zealand ...	18,800												
1911	Australia* ...													
1907	Indomitable ..	17,250												
1907	Inflexible													
	10 ships.			6 ships.			4 ships.‡			4 ships.			6 ships.	

* Australian Navy. † Doubtful; the others are interned.

TABLE III.—OLDER BATTLESHIPS.

GREAT BRITAIN. Launched.	Name.	Displacement.	ITALY. Launched.	Name.	Displacement.	FRANCE. Launched.	Name.	Displacement.	UNITED STATES. Launched.	Name.	Displacement.	RUSSIA. Launched.	Name.	Displacement.	JAPAN. Launched.	Name.	Displacement.	GERMANY. Launched.	Name.	Displacement.
		tons.			tons.			tons.			tons.			tons.			tons.			tons.
1903	Commonwealth		1904	Regina Elena ...		1903	Patrie		1905	Idaho	13,000	1906	Ioann Zlatoust◊	12,733	1899	Asahi	14,765	1904	Deutschland ...	
1903	Dominion ...		1904	Emanuele III. .	12,425	1902	République ...	14,635	1905	Mississippi ...		1906	Evstafi◊		1900	Hizen	12,700	1905	Hannover... ...	
1903	Hindustan ...		1907	Roma		1904	Justice		1904	Connecticut ...		1901	Grazhdanin ...	12,912	1901	Iwami	13,516	1906	Schlesien	13,040
1904	Zealandia ...	16,350	1905	Napoli		1907	Vérité		1905	Kansas		1900	Zoretz za Svo-	22,582	1905	Kashima	16,400	1906	Schleswig-Holstein	
1905	Africa					1904	Démocratie ...		1904	Louisiana... ...	16,000		bodu		1905	Katori	15,950	1902	Braunschweig...	
1905	Hibernia								1905	Minnesota ...					1900	Mikasa	15,362	1903	Elsass	
									1906	New Hampshire								1903	Hessen	12,997
									1905	Vermont								1903	Preussen	
									1904	Georgia								1904	Lothringen ...	
									1904	Nebraska										
									1904	New Jersey ...	14,948									
									1904	Rhode Island ...										
									1904	Virginia										
	6 ships.*			4 ships.			5 ships.			13 ships.†			4 ships.			6 ships.			9 ships.	

* These ships are ineffective, and are here retained merely for purposes of comparison with like ships of other Powers. † Idaho and Mississippi no longer appear in the list. ◊ Black Sea.

TABLE IV.—FIRST-CLASS CRUISERS.

(See the reference to ships of this class in the introductory notes.)

GREAT BRITAIN.

Speed.	Name.	Displacement.
kts.		tons.
22½	Minotaur	14,600
22½	Shannon	
23	Duke of Edinburgh	13,550
23	Achilles	
23	Cochrane	
22½	Devonshire ...	10,850
22½	Antrim	
22½	Argyll	
22½	Carnarvon ...	
22½	Roxburgh ...	
23	Monmouth ...	9,800
23	Kent	
23	Essex	
23	Berwick	
23	Cornwall	
23	Cumberland ...	
23	Donegal	
23	Lancaster ...	
23	Suffolk	

19 ships.

ITALY.

Speed.	Name.	Displacement.
kts.		tons.
22½	Pisa	9,956
22½	San Giorgio ...	9,832
22½	San Marco ...	
20	Varese	7,294
20	F. Ferruccio ...	

5 ships.

FRANCE.

Speed.	Name.	Displacement.
kts		tons.
23	Edgard Quinet	13,780
23	Waldeck-Rousseau ...	
23	Ernest Renan...	13,427
23	Jules Michelet	12,370
22	Jules Ferry ...	12,351
22	Victor Hugo ...	
21	Condé	9,856
21	Gloire	
21	Marseillaise ...	
21	Amiral Aube ...	
21	Gueydon	9,367
21	Montcalm ..	
21	Jeanne d'Arc ...	11,092
21	Desaix	7,578
21	Dupleix	

15 ships.

UNITED STATES.

Speed.	Name.	Displacement.
kts.		tons.
22	Seattle	14,500
22	Montana	
22	North Carolina	
22	St. Louis	9,700
22	Charleston ..	
22	Frederick... ...	
22	Huntingdon ...	13,680
22	Pueblo	
22	Pittsburg... ...	
22	South Dakota ...	
21	Rochester ...	8,200
21	Brooklyn	9,215

12 ships.

JAPAN.

Speed.	Name.	Displacement.
kts.		tons.
22	Ibuki	14,620
22	Kurama	
22	Asama	9,885
22	Aso	7,726
21	Ikoma	13,733
21	Idzumo	9,750
21	Iwate	
20	Adzuma	9,436
20	Tokiwa	9,850
20	Yakumo	
20	Kasuga	7,630
20	Nisshin	7,632

12 ships.

RUSSIA.

Speed.	Name.	Displacement.
kts.		tons.
21	Rurik	15,170
21	Bayan	7,900
20	Gromoboi	13,220

3 ships.

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TABLE V.—LIGHT CRUISERS.

GREAT BRITAIN.			ITALY.			FRANCE.			UNITED STATES.			JAPAN.			RUSSIA.			GERMANY.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.
32	Courageous ...	18,600	22	Basilicata ...	2,460	19	D'Entrecasteaux	4,300	35	10 *building* ...	7,100	26	Hirato	4,950	27½	*Adml. Grieg* ...	7,600	28½	*Bremen*	4,200
32	Glorious		22	Campania ...		23	Guichen	7,995	24	Birmingham ...	3,750	26	Shikuma	4,950	27½	*Svietlana*		28½	*Wiesbaden* ...	
30	*Ethingham* ...	9,750	29	Quarto	3,220	23	Jurien de la Gravière ...	8,151	24	Chester		26	Yahagi	4,950	27½	*Adml. Boutakoff*		28½	*Leipzig*	
30	*Frobisher*		28	Marsala	3,400			5,595	24	Salem		22½	Chitose	4,992	27½	*Adml. Istomin*		28½	*Magdeburg* ...	
30	*Hawkins*		28	Nino Bixio ...				2,285	20			20	Niitaka	3,420	27½	*Adml. Korniloff*		34	Bremse	4,000
30	*Raleigh*		20	Puglia	2,498			2,421	20			23	Tone	4,035	27½	*Adml. Spiridoff*		34	Brummer	
30	*Vindictive* ...							3,970	19			20	Tsushima	3,420	27½	*Adml. Lazareff*		28½	Dresden	
29	Danae							3,890				20	Tsugaru	6,630	27½	*Adml. Nakhimoff*		28½	Emden	
29	Dauntless ...							3,890							20	Aurora	6,731	28½	Karlsruhe	4,200
29	Dragon														23	Askold	5,905	28½	Köln	
29	*Jacãdlus* ...														23	Bogatyr	6,675	28½	Königsberg ...	
29	*Juring*	4,650																28½	Nürnberg	
29	*Despatch*																	27½	Pillau	4,300
29	*Diomede*																	27½	Frankfurt ...	5,000*
29	*Dryad*																	27½	Regensburg' ...	
29	*Delhi*																	27½	Graudenz	
29	*Dunedin*																	27	Stralsund	4,500
29	*Durban*																	27	Strassburg ...	
29	Cairo																	27	Augsburg ...	4,280
29	Calcutta																	25½	Kolberg	4,234
29	Capetown																	23½	Stettin	3,396
29	Carlisle																	23	Hamburg ...	
29	Colombo																	23	Berlin	
29	Cardiff																	23	München	3,200
29	Ceres																	23	Lübeck	
29	Coventry	4,190																23	Danzig	
29	Curacoa																	21½	Arcona	2,657
29	Curlew																	21	Amazone	2,618
29	Caledon																			
29	Calypso	4,120																		
29	Cassandra																			
29	Caradoc																			
29	Cambria																			
29	Canterbury ...																			
29	Castor	3,750																		
29	Constance																			
29	Centaur																			
29	Concord																			
25½	Birkenhead ...	5,250																		
26	Chester																			
29	Calliope																			
29	Conquest																			
29	Cordelia	3,750*																		
29	Carysfort																			
29	Cleopatra																			
29	Comus																			
29	Caroline																			

* Estimated.

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TABLE V.—LIGHT CRUISERS (*continued*).

GREAT BRITAIN.			ITALY.			FRANCE.			UNITED STATES.			JAPAN.			RUSSIA.			GERMANY.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.
29	Champion ...	3,750*																		
29	Aurora	3,500																		
29	Galatea	3,500																		
29	Inconstant ...	3,500																		
29	Penelope	3,500																		
29	Phaeton	3,500																		
29	Royalist	3,500																		
29	Undaunted ...	3,500																		
26	Birmingham ...	5,400																		
26	Lowestoft ...	5,400																		
26	Nottingham ...	5,400																		
26	Brisbane† ...	5,400																		
25‡	Chatham	5,400																		
25‡	Dublin	5,400																		
25‡	Southampton ...	5,400																		
25‡	Melbourne† ...	5,400																		
25‡	Sydney†	5,400																		
24‡	Dartmouth ...	5,250																		
24‡	Weymouth ...	5,250																		
24‡	Yarmouth ...	5,250																		
25	Bristol	4,800																		
25	Glasgow	4,800																		
25	Gloucester ...	4,800																		
25	Liverpool	4,800																		
25	Newcastle ...	4,800																		
25	Fearless	3,440																		
25	Active	3,440																		
25	Blonde	3,440																		
25	Blanche	3,350																		
25	Bellona	3,350																		
25	Boadicea	3,300																		
23	Amethyst... ...	3,000																		
22	Diamond	3,000																		
22	Sapphire	3,000																		
22	Topaze	3,000																		
25	Adventure ...	2,670																		
25	Attentive... ...	2,670																		
25	Foresight... ...	2,850																		
25	Forward	2,850																		
25	Patrol	2,940																		
25	Pathfinder ...	2,940																		
25	Sentinel	2,895																		
25	Skirmisher ...	2,895																		
	90 ships.‡			6 ships.◊			3 ships.			13 ships.			8 ships.			11 ships.			28 ships.	

* Estimated. † Australian Navy. ‡ Four projected. ◊ Two projected.

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Effective Fighting Ships, Built and Building.

The rapidly diminishing value of the older battleships and first-class or armoured cruisers makes them no longer effective. The United States and other Powers retain ships long on their lists, and therefore British ships are kept here for purposes of comparison.

Class.	Great Britain.			United States.			France.			Italy.			Japan.			Germany.			Austria.			Russia.		
	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.
Battleships:—																	†							
Modern	35	—	35	17	6	23	12	5	17	6	4	10	7	2	9	19	2	21	2	—	2	8	—	
Battle-cruisers ...	9	1	10	—	6	6	—	—	—	—	—	—	4	—	4	5	1	6	—	—	—	—	4	4
Older Battleships	6	—	6	13	—	13	5	—	5	4	—	4	6	—	6	9	—	9	—	—	—	4	—	4
Cruisers:—																								
1st Class	19	—	19	12	—	12	15	—	15	5	—	5	12	—	12	—	—	—	—	—	—	3	—	3
Light	77	13	90	3	10	13	3	—	3	6	—	6	8	—	8	24	4	28	—	—	—	3	8	11
Destroyers ...	282*	108	390	95	231	326‡	76	20	96	48	10	58	89	?	?	—	—	—	—	—	—	122	—	122‖
Submarines ...	?	?	?	59	63	122	88	?	?	73	8	81	26	?	?	—	—	—	—	—	—	32	—	32

* Excluding 97 destroyers of classes A to F. A number of destroyers have been completed since this table was made up early in April.

† The Mackensen battle-cruiser is the only German ship that may be completed. The other vessels indicated in this column will not be proceeded with.

‡ Twelve destroyers projected.

‖ The destroyer and submarine figures given for Russia represent the situation before the war, except that vessels known to have been lost have been removed from the lists.

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CHAPTER V.

War Developments in Warship Propelling Machinery.

The stimulus of war has had a pronounced influence in the development of warship propelling machinery, as it has in other branches of applied science which can be utilised to increase the efficiency of military appliances. The inventive faculty was quickened, not only by an all-prevailing patriotism but by the readier ear given to suggestions and the greater tendency carefully to consider proposals which involved departure from traditional practice. Caution is a well-known attribute of the official mind, but the tremendous issues of the war forced the pace in progress. The risks were justified, and giant strides were taken which in peace times would have been considered imprudent and would only have been allowed by short steps. It is now permissible to disclose facts which prove that, in the five years of war, developments have been made far exceeding those credited to the preceding twenty or thirty years.

Lines of progress.

The forward movement has been along extensions of well proved lines. It is a case not so much of innovation as of the application on a great scale of principles and mechanism which had been introduced tentatively, if not experimentally, in the years immediately preceding the war. Engineer Vice-Admiral Sir Henry J. Oram, when Engineer-in-Chief of the Fleet, and the Deputy Engineer-in-Chief and successor from June, 1917, Engineer Vice-Admiral Sir George G. Goodwin, showed together great enterprise, and thus, when the call was made for higher powers in order to attain the great speeds demanded by the naval tactician, it became possible, with the exercise of courage, to achieve for mighty ships all that was desired in the way of speeds without undue risks and in association with a high degree of efficiency.

The test of machinery in war.

The wealth of the scientific investigation and experiment during the years preceding the war were demonstrated also in the reliability of the machinery throughout the long ordeal of naval operations. In the old days it was considered sufficient during the trials of a warship to maintain full speed for four hours. Later, this was changed to eight hours, but during the war ships have been run for days at powers and speeds exceeding those for which the machinery was designed, showing that the factor of safety was not only adequate

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but generous. Further, it has not been possible to arrange in the case of all ships for a thorough overhaul at periodic intervals, as in peace, and yet, everything considered, there have been throughout the war fewer defects and breakdowns than were experienced, for instance, during the period of manœuvres in peace times, relatively, of course, to the number of ships engaged. The continued steaming at high speeds led to some undue wear, and as there was little time for replacements, ships did get into a crippled condition occasionally. Leaky condenser tubes, or "condenseritis" as it was called in the Service, was perhaps the most prevailing trouble. This led to priming in the boilers, with minor difficulties in the turbines. The attention given in recent years to the improvement in non-ferrous metals is having, and will continue to have, its effect in removing this condenser trouble, but leaky tubes were not always the cause of the priming, and an instance may be mentioned to show how unforseen difficulties may arise. In one ship the exhaust steam-pipe from the forward capstans was smashed by shell when the ship was in action, and as the cruiser forged ahead at a great speed the sea-water flooded through the pipe into the exhaust steam system, and thus into the feed supply of the boilers. The engineer, of course, knew nothing of the mishap, and soon the speed of the cruiser dropped to 10 knots. Here is one point for the advocate of the electric driving of all auxiliary machinery, including that on deck. The turbine has come through the ordeal of war admirably, and mechanical reduction gearing between turbine and propeller, as will presently be shown, has proved all that was claimed for it.

Increase in engine-power.

It is easy to show at a glance the great developments during the war in power, speed and efficiency. In the twenty years preceding the war the engine-power of battleships increased from 12,000 I.H.P. to 30,000 S.H.P., while the speed of the ship advanced from 17 knots to 23 knots. At one step during the war we advanced to the 75,000 H.P. of the Queen Elizabeth class, while the speed reached 25 knots, notwithstanding that the displacement tonnage had advanced to 27,500 tons. Still more remarkable is the development in cruisers. In the twenty years before the war the engine-power of what were then designated "first-class cruisers" advanced from the 25,000 I.H.P. of the Powerful to the 78,000 S.H.P. of the Queen Mary, while the speed of the ship increased from 23 knots to 28 knots, with a doubling of the displacement tonnage to 27,000 tons. In the five years of the war successive steps have resulted in the length of the ship being doubled, the power of the propelling machinery has also been doubled, and there are now several cruisers with almost the offensive and defensive power of battleships, having a speed of

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32 to 33 knots. Nor is this the final word. Japan, for instance, is building cruisers with machinery of 160,000 S.H.P., and the United States of America similar ships of 180,000 S.H.P. In the case of torpedo-boat destroyers, the displacement tonnage had become 965 tons when war broke out, the power 24,500 S.H.P., and the speed 29 knots. During the war up to the date of the Armistice, 305 vessels of the class, twenty-five being flotilla leaders, have been completed, and the speeds range up to 39·6 knots, maintained for four hours and measured on the Skelmorlie mile, 34 and 35 knots being quite an ordinary speed. The powers range up to over 40,000 S.H.P. Here, too, it may be added that, in the case of submarine boats, steam-driven vessels have attained 24 knots and oil-driven vessels 18 knots, on the surface; when submerged our vessels have attained speeds of 15 knots. All these results far exceed those attained by ships of any other nation.

Reduction in weight of machinery.

It may be contended that this increase in power is more a question of money than a measure of advance in the applied science of engineering. That is partly true, but increase of size in engineering structures is not a matter of simple arithmetic. Every enlargement introduces new problems, and is fertile in surprises, with the result that not only skill but grit and courage are needed for rapid advances. Further, development in one department involves correspondent development in others, and the complete result is not attained unless there is increased efficiency in all units, which constitute the whole organism. Weight saved in the propelling mechanism—in the machinery, and fuel burnt per unit of power—enables the naval architect to increase the armament and armour protection of his ship, and these, together with speed and manœuvring capacity, constitute the fighting power. In the twenty years prior to the war the weight of battleship machinery was reduced from 242 lb. per I.H.P. to 174 lb. per S.H.P., while to-day the weight is about 110 lb. per S.H.P. The results for cruisers are equally striking. The twenty years' progress showed a decrease in weight from 194 lb. per I.H.P. to 146 lb. per S.H.P. burning coal, or 113 lb. burning oil; while now the weight is about 75 lb. S.H.P. burning oil. In the case of destroyers, the weight decreased from 50 lb. per I.H.P. to 35 lb. per S.H.P., and during the war there has been a further reduction to about 30 lb. per S.H.P. But the fuel supply must also be debited against the displacement demanded by the engineering department of the ship. It is for the strategist to determine the desirable radius of action of a warship, and consequently he fixes the capacity of the bunker for the fuel. In this connection, it may be interjected that none of our ships left port during the war

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without a full supply of fuel; whereas it is now known that the German ships, in their venturous runs into the open sea, carried a minimum supply. They took the risk of being driven from their base by the intervention of a superior British force between them and their port. The lesser weight of fuel carried, however, gave them a superior speed than would otherwise have been the case, because it reduced the displacement of the ship. This was their practice in the attaining of their much advertised trial-trip speeds—a point which has been referred to in previous issues of the *Naval Annual*.

Gains due to oil fuel.

It is the function of the engineer to convert into useful work the greatest possible proportion of the heat value of the fuel. His success in this respect affords a true measure of progress, and the developments immediately preceding and during the period of war show that much valuable work has been done to this end. In the adaptation of the boiler to the use of oil fuel there was great gain. Briefly expressed, the advantages of oil over coal are that the radius of action is increased by 50 per cent. for a given weight of fuel, or 80 per cent. for a given capacity for fuel. The thermal efficiency in the boiler is increased from 60 per cent. in the case of coal to about 70 per cent. in the case of oil; the boilers can also be forced to the extent of 50 per cent. above their normal steam-raising capacity, and this is the more important with turbine machinery, as it also can be overloaded. Thus, destroyers having turbine machinery of a normal S.H.P. of 30,000 have during the war been, on occasions, forced up to 40,000 S.H.P., greatly increasing the speed. This facility for overloading the machinery proved invaluable to our destroyers and cruisers when they had to chase the retreating enemy. There are other incidental, yet important, advantages due to oil fuel. The smoke question was one which, in the initial stages, proved difficult of solution, but success was achieved before the war, and thus there was no cloud then of smoke by day to disclose the movements of a squadron. On the other hand, when a smoke screen was required, it was easily produced in great density from the funnels of warships. Stokehold labour was reduced by about 70 per cent. in the case of oil fuel, and the ships could easily have their oil bunkers filled while at sea.

Geared turbines universally applied.

The most significant, and the most important, achievement during the war has been the reduction of fuel necessary per unit of power developed. Prolonged tests showed that with oil of a calorific value of 18,430 B.T.U's, 1 lb. of oil evaporated from and at 212 degrees F. 14·38 lb. of water, against 9·35 lb. with coal, while the efficiency of the boiler, at highest output, was 73·37 per cent.,

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against 62·28 per cent. when using coal. The recent progress in the prime mover is still more marked. The turbine had proved itself thoroughly efficient prior to the war, but the principle of introducing helical gear between the turbines and the propeller shaft, first introduced in a launch by Sir Charles Parsons in 1897 and in a cargo vessel of moderate speed in 1909, was still in a more or less trial stage in the Navy at the beginning of the war. Two torpedo-boat destroyers, with partly geared turbines, had been in commission from August, 1912, and one of two all-geared torpedo-boat destroyers on order had completed exhaustive trials. A cruiser with geared turbines was ordered early in 1914. Since then gearing has become universal in warships, because it increased greatly the efficiency alike of the turbine and the screw propeller. The reason for its original adoption was, that it enabled the turbines to be run at the high rate of speed most conducive to steam efficiency, while, at the same time, the revolutions of the propeller were reduced to the most effective rate. This was an important point in the Merchant Service where the speed of the ship was low; but even in destroyers it was found to give good results. Prior to the fitting of reduction geared turbines in destroyers, the propeller efficiency was rarely over 42 per cent.; whereas with geared turbines this has been increased to over 50 per cent. This is an important contribution towards the reduction of steam consumption, and therefore to fuel economy. The principle has been carried still further by introducing a double stage in the gearing, particularly in low-power merchant ships, so that with the turbines, for example, running at 3500 revolutions per minute, the propeller only makes seventy-eight turns per minute—a ratio of 45 to 1. The adoption of single reduction geared turbines resulted in a saving of nearly 25 per cent. in fuel, and a further saving of 10 per cent. is probable by the adoption of double reduction gearing. The larger propeller possible with gearing improves the manœuvring quality of torpedo-boat destroyers.

Economy due to gearing.

In battle-cruisers the single reduction geared turbines are designed for a consumption of steam of about 9·9 lb. per S.H.P. at full power, excluding the steam required for auxiliary machinery, but including this, the consumption is only 11·15 lb. in the case where the exhaust steam from the auxiliaries passes into the turbines, as is the case in most ships. Thus it will be seen that we have reached the stage when little more than three-quarters of a pound of oil is sufficient to maintain 1 H.P. per hour. In light cruisers of the new twin-screw type, each driven by a complete set of compound turbines and gearing, the steam consumption is 10·3 lb. per S.H.P., or including auxiliaries 11·5 lb. Even at one-fifth of the full power

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the consumption for the turbine only is 12·8 lb. per S.H.P. The case of the destroyers is specially marked. At the outbreak of the war, the light cruisers being built were generally propelled by three screws, each shaft being driven by turbines, geared cruising turbines being fitted on two shafts. The steam consumption with such an arrangement was, for the turbines only, about 12 lb. per S.H.P. at full power, 15 lb. at one-fifth of the power, and 16 lb. at one-tenth of the full power. In the latest destroyers, where single reduction gear is fitted with the set of compound turbines used for driving each of the two shafts driving the twin-screw propellers, the steam consumption was brought down to 10·7 lb. per S.H.P. at full power, 12·15 lb. at one-fifth of the power, and 15 lb. at one-tenth of the power. These consumptions are based on a vacuum of 27 in. The change over from the directly-driven turbines to the two-shaft all-geared turbines, permitted not only the large increase in propeller efficiency, already referred to, but an improvement in the steam consumption of the turbines of about 10 per cent. at full power.

Rigidity of gear wheels.

The universal adoption of gearing has been assisted by the improvement in the method of cutting the helical teeth. The accuracy demanded of the cutting machines is such that in "grooving" a wheel 10 ft. in diameter the maximum error between two adjacent teeth must not exceed 0·0015 in. An important question in connection with gearing has reference to the rigidity of the wheels. Steel being an elastic material, the shape of a pinion when transmitting power is not the same as when idle. Under load, one end of the pinion twists relatively to the other, so that if the pinion has, as is usual, helical teeth, the pitch of the helix is altered the moment the load comes on. The large gear wheel, of course, also twists under its load; not only is this wheel much stiffer than the pinion but the twist comes on in the opposite direction. Hence, if the teeth of the pinion and the wheel were cut so as to match with absolute perfection at the outset, this condition is destroyed the very instant power is passed through the gears. In consequence of this alteration of form, the pressure between the teeth of the pinion and the teeth of the wheel is not uniformly distributed along the line of contact of teeth, but is greater at one end than at the other; in fact, if the pinion were sufficiently long, it is conceivable that at the one end there might be an actual space between the pinion tooth and the corresponding wheel tooth, whilst at the other end of the pinion there might be an excessive concentration of pressure. In order to reduce this inequality in the pressure along the teeth of a gear, Mr. John H. MacAlpine introduced in the United States warships

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the device known as a "floating frame." This frame carries the pinion complete with its bearings, and is itself mounted flexibly in the gear casing, in such fashion that it can tilt slightly in a fore-and-aft direction. The pinion is, in its turn, flexibly connected to its driving shaft, and is thus free to tilt with the frame. The consequence is that, as the load comes on the gear and the teeth deform, the pinion tilts so as to equalise the pressure along the line of contact. The correction thus effected is not perfect, but on the usual theory the noxious effect of the twist is reduced to about one-third of what it would be in the case of a rigidly-mounted pinion. Opinion as to the practical value of the floating frame is divided. Builders of rigidly-mounted gears point out that experience proves that in practice a very uniform distribution of pressure is secured with gears having rigidly-mounted pinions, and they claim accordingly that the floating frame is a useless complication.

Tooth pressures in gearing.

On the other hand, it is claimed that much less skill is required to fit and mount the gears when a floating frame is used than is necessary when the pinion is rigidly mounted. That tooth pressures are largely equalised with rigidly-mounted gears is well established by experience, and various views have been advanced as to how this condition is brought about. Some light on the subject is, perhaps, afforded by Mr. F. W. Lanchester's observations on the behaviour of worm drives for motor cars. He finds that, although the lubrication of these gears is perfectly maintained, and although the friction is very small, yet the intensity of the pressure between the teeth is so high that the material flows under it. Under the wiping action of one tooth over the other a fin is ultimately formed projecting beyond the edge of the tooth, and this fin has to be removed periodically. The form of the tooth is, however, maintained, and, after trimming off the fin, the worm wheel is good for another run of several thousands of miles before it requires attending to again. The stress required to cause the hard phosphor bronze of the worm wheel to flow can hardly be less than 30 tons per sq. in. From the theory of lubrication, it appears that in ordinary turbine gears the maximum pressure attained in the film of oil between the teeth is of the order of 3 or 4 tons per sq. in., and this film of oil has a maximum thickness of about $\frac{1}{8000}$ in. From Mr. Lanchester's observations it is shown that stresses of more than ten times the above amount can be carried without breakdown of the lubrication, which will in fact be maintained even under stresses at which the metal itself will flow. A flowing of the surface sufficient to reduce by $\frac{1}{1000}$ in. the tooth thickness at the point where the pressure is concentrated would suffice to equalise the tooth pressure about as well as the floating frame does. This is

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apparently what occurs with rigidly-mounted gears. No trouble results, because, as Professor Sweet pointed out many years ago, "a thing that cannot wear out of shape will not wear much." On the theory that danger of abrasion fixes the working pressure on the teeth, this pressure should vary as the square root of the pinion diameter. Mr. MacAlpine, the inventor of the floating frame, takes another view, and assumes that the permissible pressure is directly proportional to the pinion diameter. He thus loads large pinions more highly than is done in our naval machinery and small pinions less heavily. In comparisons of working pressures it is important to note whether the figure given applies to continuous running or not. A tooth pressure of 1100 lb. per linear inch has been attained with rigidly-mounted turbine gears running astern. Owing to the fact that stresses were reversed, this test was particularly severe, and some trouble occurred. In general, for continuous running, British practice is to limit the working pressure to $150\sqrt{d}$ up $220\sqrt{d}$ where d is the pinion diameter in inches. In the British Navy the pinions now in use range from 8 in. up to 27 in. in diameter.

Double-reduction gearing.

Whether the double reduction gear, which has given satisfactory results in low-power vessels, will be applied in high-speed warships is problematic. There is a limit to the size of the propeller, and if, as in the case of the new Japanese cruiser already referred to, each screw is to transmit an effective power of 45,000 H.P. to the ship, the revolutions must be kept pretty high in order to keep the propeller within practical limits of size. In battleships the propeller revolutions number now about 300, in battle-cruisers 210 to 275, and in destroyers 350. Where single reduction gear is fitted, these revolutions are found to give satisfactory results, so that it is doubtful if any further reduction in the rate of revolution of the screw would be desirable. The steam economy with single reduction gear is also satisfactory, and has not, in so far as the British Navy is concerned, encouraged the adoption of electrical transmission between the turbine and the propeller as in the United States of America.

Electrically driven U.S. battleship.

The putting into commission of the U.S.A. battleship New Mexico with this electric transmission system has greatly increased interest in the subject. The system appeals to the imagination particularly of naval officers of executive rank; it savours of the simplicity of "you touch the button and the engine does the rest." There are, however, many practical disadvantages incidental to this system to which reference will be made presently. But first it is important to consider its efficiency as a means of transmitting power to the propeller. The New Mexico has two turbo-electric generating sets of 11,400

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kilowatt capacity. These have no mechanical connection whatever with the propeller shafts. The electric power is transmitted to motors of 6600 nominal H.P.—one on each of the four propelling shafts, the motors being close to the stern of the ship. These are reversible motors, so that there are not, as in the ordinary turbine mechanical transmission system, separate turbines for driving the ship astern. The designed power was equivalent to 28,000 S.H.P., but at the trial the S.H.P. in the six hours' trial at full power averaged 31,197, the rate of speed attained on the six hours averaging 21·08 knots. The results of all the trials are given in Table I.:—

TABLE I.—RESULTS OF TRIALS OF THE U.S.A. BATTLESHIP NEW MEXICO, WITH ELECTRIC TRANSMISSION GEAR.

Average Speed in knots.	Average Revolutions per min.	Average Horse-Power.	Fuel Consumption, lb. per hour.	Ship Displacement, Tons.
10·26	80·49	3,690	7,308	32,624
14·98	115·35	9,648	12,548	32,650
19·37	152·20	23,235	24,503	32,700
21·08	167·69	31,197	31,130	32,774

Trial results.

Importance need not be attached to the increased power as it was not due to the electric transmission, but, as has already been explained, to the fact that with oil fuel and steam turbines overloads can easily be maintained for long periods. The steam consumption at full power for all purposes was equal to just over 11 lb. per S.H.P., which is no better than is realised with single reduction geared turbine installations of corresponding powers. At one-tenth of full power, however, the steam consumption for all purposes was equal to about 14 lb. per S.H.P. This is a little better than has hitherto been attained at this power in ships with single reduction geared turbines; but the advantage is due to two causes. First, when running at a fraction of the full power it is only necessary, with the electric system of transmission, to put into operation one or more turbo-electric generating units to supply the electricity to the motors. Each turbo-electric generating unit can thus be worked at nearly full power and therefore give maximum efficiency. This undoubtedly is a great gain. When making the eastward trip from the United States to France only one turbo-generator set was run: this was sufficient for the speed desired on the voyage. On the return voyage westward one of the sets was out of action owing to turbine troubles. The second reason for the higher economy at low power is the fact that all auxiliaries in the

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engine room are run electrically, and it is well known that in ordinary ships such auxiliaries are great steam eaters. Thus from 20 to 25 per cent. of the steam consumption for all purposes in battle-cruisers and light cruisers is accounted for by auxiliaries. A large part of the gain in the New Mexico must, therefore, be attributed to the incidental rather than to the direct causes. There would be no difficulty in running auxiliaries by electric motors in ships fitted with mechanically geared turbines, particularly as turbo-generating sets have in any case to be provided for lighting purposes in all warships.

Weight of electric and geared machinery.

There is next the question of weight. If any saving effected in fuel carried for a given radius of action is counterbalanced by increased weight of the installation itself, there is no gain possible in substituting electric for mechanical transmission for utilisation in increasing fighting elements in the design of a warship. The New Mexico installation is said to weigh about 2350 tons, and this works out at the equivalent of 170 lb. per S.H.P. developed on the full-power trial, whereas the machinery of approximately corresponding power in our warships works out at 140 lb. per S.H.P. This represents a difference of about 400 tons against the New Mexico machinery. It must be admitted, however, that this is the first battleship fitted with the system, and there is a probability of improvement in this and other respects.

Advantages and disadvantages of electric system.

The propelling machinery is electrically controlled by switches which can be placed almost in any part of the ship. The whole of the manœuvring of the machinery of the electrically-propelled vessel can thus be effected from any point of the ship that may be desired. In fact, several manœuvring stations may be installed since interlocking is easy. In this regard the electric drive has no rival. The value of the other claims made for it is, however, disputed. Advocates of the electric drive point out that full power is available for going astern, instead of only 40 to 50 per cent. of the full power which is available for this purpose with gear drives. In reply advocates of the latter assert that the limit to the power available for going astern is fixed by the danger of cavitation, which is likely to give trouble in high-speed vessels, if on reversing from full speed ahead to full speed astern the power transmitted suddenly is much in excess of 50 per cent. of the full power ahead. Since with the electric drive the turbines operate under power station conditions, it is claimed that as high temperature of superheat may be safely adopted with this system at sea as is usual on shore, the consequent gain in steam economy would be, of course, considerable. When reverse turbines have to be fitted in connection with gear drives

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there is a danger that sudden admission of superheated steam to the reverse turbine, in changing from going ahead to going astern, or to the ahead turbine when going forward again, may cause dangerous distortions of the turbine casings with consequent blade stripping. There is no doubt weight in this contention, but the difficulties are perhaps not insurmountable. The trouble with the New Mexico on her westward voyage is said to have been due to blade stripping. On the other hand, advocates of mechanical gearing assert that at Jutland electric gear of every kind gave trouble. Under the shocks of exploding shells and the like, switches were thrown out, and circuits broken all over the ship; whilst the mechanical and hydraulic equipment proved satisfactory. Here, again, the difficulty of making shock-proof circuits is probably not insuperable. The high turbine efficiencies claimed for the electric drive at cruising speeds are discounted for three reasons. In the first place the advantage is small when the most approved arrangement of cruising turbines is fitted to a gear-driven ship; secondly, the losses with electric transmission are higher than with gears.

British attitude towards electric drive.

The British Admiralty have adopted more than a waiting and watching policy. From 1906 onwards the subject has been carefully considered, and electric propulsion machinery designs for battleships have been prepared at intervals. Electric transmission is fitted in the K submarines. These vessels are driven by twin screws, which can be operated by electric motors working through helical gearing, the ratio of reduction being 2 to 1, but the main propelling machinery consists of two sets of single reduction geared turbines, supplied with steam by two boilers having a working pressure of 235 lb. and burning oil fuel. Each set of turbines consists of one high-pressure and one low-pressure turbine, while an astern turbine is incorporated in each low-pressure turbine. The reduction gear reduces the revolutions from 3500 per minute in the case of high-pressure turbines, and 2800 in the case of low-pressure turbines, down to 400 revolutions in the case of the propeller. In addition, there is an 8-cylinder 800 B.H.P. oil engine, which drives the dynamo generating current for operating the electric motors on the propelling shaft, or for charging the batteries. Thus, at cruising speed, the ship is driven by the oil engine with electric transmission gearing to the motors of the propellers, while at full speed the usual steam turbines are used. Thus experience will be gained in the practical operation of electric transmission.

Experiments in turbine design.

Towards the perfection of the details and design of the turbine there has been a steady progress. The Parsons turbine has been proved not only efficient and economical but thoroughly reliable. So

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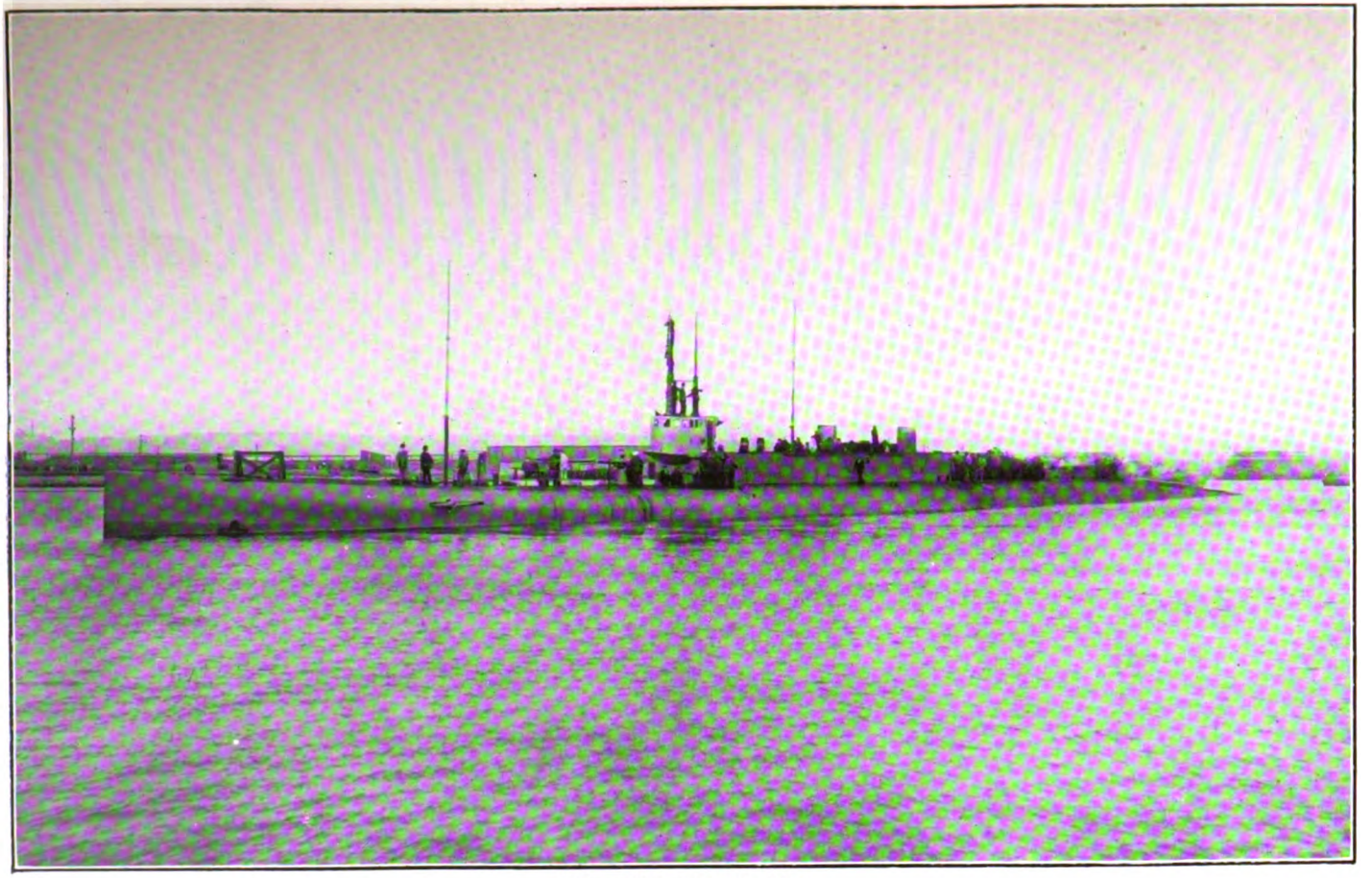

H.M. SUBMARINE K 3.

(1880-2650 tons, 10,000 to 1,400 H.P., 24-9 knots, 1 4-in., 1 3-in. H.A., 8 18-in. T.T.)

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far as it is concerned, progress has been mainly in assuring the best material for blades and stiffeners. The Brown-Curtis, which is a turbine of the impulse type, is the only design which shares with the Parsons machine popularity in the British Naval Service. In foreign navies there are only exceptional applications of other types. Messrs. John Brown and Co. have made continuous experiments directed towards achieving almost completely satisfactory results with the Brown-Curtis machine. As is well known, it consists largely of wheel stages, separated by diaphragms. In their experiments they began with diaphragms of various shapes and differences in thickness of metal and with split and solid types, submitting these to tests by loading the parts with copper ingots. The first of the larger diaphragms thus tested deflected by fully $\frac{5}{8}$ in., and, as this was regarded as excessive, the design was modified and strengthened. The tests of experimental diaphragms in cast iron showed remarkable results; in one such case a diaphragm of 72-in. radius yielded fully an inch at the centre opening, through which the spindle passes, without fracturing. With the housing which carries the thrust block attached to, or cast as part of, the turbine casing, any deflection of the turbine casing end produced a corresponding fore-and-aft movement of the turbine rotor, which movement reduced the designed working clearance between the blading mounted on the rotor and the stationary blading carried by the casing, and this reduction tended to endanger the safe working of these parts. Numerous experiments were therefore carried out with turbine casing parts having the casing end specially designed to give a minimum deflection under the load due to steam pressure, and the best form of end for the purpose was thus determined. The experience obtained from these experiments on the diaphragms and casing parts, and in the construction of the turbines for the light cruisers, gave sufficient data to enable Messrs. John Brown & Co. to undertake with complete confidence the design of Brown-Curtis turbines for the battle-cruiser Tiger, which represented a marked departure both in the design and in the power of the turbines. Whereas the earlier turbines were of the simple type, *i.e.*, designed to permit the full expansion of the steam to take place in one casing both for ahead and astern working, the turbines built for the Tiger were the first of the Brown-Curtis type to be subdivided into high-, intermediate- and low-pressure units, and the power developed by the engines of the Tiger was approximately four times that obtained with the largest of the simple turbines constructed up to that time.

Tests of geared turbines.

In certain of the three-shaft destroyers, it was arranged to fit small turbines designed for use at cruising powers. These turbines

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ran at comparatively high revolutions, and transmitted the power developed, through reduction gearing, to the spindles of certain of the main turbines. The adoption of these high-speed turbines necessitated the consideration of certain aspects of design which had not been met with in the earlier direct driving turbines. Accordingly, a series of experiments were carried out to test:—(1) the suitability of the attachment of the blading to the rotor wheel rim; (2) the strength and rigidity of the rotor wheel discs; (3) the accuracy of the formulæ for determining the forced fit which it is necessary to provide in order that the hub of the rotor wheel may continue to grip the rotor spindle at the maximum revolutions to which the turbine is likely to be driven. The results of these experiments furnished data which have been used since for all designs of this type of turbine.

Tests as to stresses on rotor wheels.

In designing main turbines to run at high speed, and to transmit the power developed to the propeller shafts through mechanical reduction gear, it was decided to develop the Brown-Curtis turbine for this purpose, along similar lines to those carried out with the Curtis turbine for power installation on land. This turbine is made up of a series of discs mounted on a spindle and separated by diaphragms, the principle being generally the same as in the earlier slow-speed turbines, except that, with the high-speed turbines, the number of rows of blades carried by each wheel is reduced, and in most stages each wheel carries a single row of blades. In order to prevent heavy stresses due to centrifugal forces, the rotor wheel is designed as light as possible at the rim and in the web, and the question arose as to whether these wheels would be sufficiently rigid to withstand the tendency to distortion resulting from the pitching of a vessel in a sea-way. In order definitely to settle this question, a single stage turbine was specially constructed, consisting of a wheel disc of 72 in. diameter fitted to a short spindle in a suitable casing, the complete turbine being mounted on a frame carried on trunnions, and free to oscillate in a vertical plane. A reversing engine was attached to this frame by means of bell crank connections, and thus the entire structure was caused to oscillate in periods corresponding to the estimated periodicity of a destroyer in a rough sea-way. Numerous and lengthy experiments were carried out with this apparatus, and finally an uninterrupted test for one month was made as representing the treatment which such parts might receive during a long trip at sea. On opening up the turbine after this test, all parts were found in perfect condition, and the evidence of any momentary distortion indicated under running conditions by special fittings, was that, with a properly designed and proportioned wheel,

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any distortion through such movement of these parts is so small as to be negligible.

Tests of metals.

In high speed turbines with stages having a single row of blades on a rotor wheel, it is desirable that the nozzles should be continuous in order that the steam may be delivered in the full annulus of the blading. To accomplish this condition, the partition plates carrying the nozzle vanes must transmit the load on the diaphragm (due to the pressure difference on the inlet and discharge sides) to the outer part of the diaphragm and thence to the support or fixing in the turbine casing. Ordinarily these division plates are of steel and are cast into the metal so as to form part of the diaphragm. Many experiments have been carried out to ascertain the best method of moulding these parts and the best position for the pouring of the molten metal into the mould in order that the cast metal may form securely about the ends of these steel plates while avoiding any burning of the plate ends. These experiments have been carried out in cast iron and with different qualities of phosphor bronze, and, in order to ascertain the suitability of such metals, sample pieces have been subjected to test, both in the cold state and when heated to such temperatures as may be expected in service.

Blade connections with rotor.

The fixing of the blades to the rotor parts is a most important detail in the designing of high-speed turbines, and, in such cases where this attachment is highly stressed, exhaustive tests have been carried out with blades mounted in sections of steel rims and having these parts subjected to pulling tests until fracture occurred in the weaker part. The results obtained from such tests have formed the basis of the present design of this detail in the Brown-Curtis turbines. Ample margin, or factor of safety, is allowed between the maximum load which can come on the part and the ultimate strength of the parts as ascertained by the tests already described.

Gland packing.

The carbon gland packing, which has been a feature of the Brown-Curtis turbine since the earliest designs, has been regarded as a very desirable fitting and with it practically no trouble has been experienced in service. One especially good feature of this type of gland is that it runs on a parallel spindle and makes possible sufficient fore-and-aft movement of the rotor to enable the axial clearance of the blades and nozzles to be actually checked by movement of the rotor after the turbine is fully assembled. Extensive tests have been made with full glands run under test conditions intended to reproduce the conditions of service. Glands differing somewhat in design have been subjected in this special plant to continuous running, for periods extending as long as forty days, intended to represent a full sea trip in a vessel driven at full speed. Carbon packing of several different

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mixtures has been experimented with and all results have been most carefully noted and analysed, these results confirming the belief that the gland, as now fitted with carbon packing, is a simple and reliable fitting.

Suspension of condensers to turbines.

With reduction gearing, it has been found possible so to place the turbines that the condenser can be attached to the under side of the low-pressure turbine, as has been the invariable practice in electrical power installations on land. Such a direct connection naturally results in small gains in economy and eliminates the weight and the expense of fitting a separate exhaust pipe. The suspending of heavy condensers from the turbines has necessitated careful consideration in the design of the turbine casing and its supports, even with the Brown-Curtis turbine in which the tip clearances are so large as to make the rotating parts relatively independent of small distortion of the casing. In order to check the accuracy of design of the casing and supports, tests have been carried out in the Clydebank shops—first, with a turbine and condenser for a torpedo-boat destroyer, and, secondly, with a turbine and condenser for a battle-cruiser. In both cases measurements were taken under the following conditions:—(*a*) with the bottom half turbine casing resting on supports, (*b*) with the bottom half casing and with the rotor in place, (*c*) with the bottom half casing, with the rotor in place and the condenser suspended in position, (*d*) with the turbine completely assembled and with the condenser suspended from the bottom casing exactly as the parts would be assembled in the ship. The measurements taken on these tests indicated that the casing scantlings in these particular designs are sufficient for the loads, but these measurements also indicate the tendencies to distortion under such conditions and have made it possible in subsequent designs to arrange stays and stiffening ribs in such positions so as better to resist the tendency to distort.

Material of blades.

High blade speeds have naturally resulted from the higher revolutions usual with the later designs of turbines, and whereas, in the slower running direct-driving turbines, brass composition blading material possessed sufficient strength to withstand the stress due to steam load and the small additional stress due to centrifugal force, it was found necessary with high-speed turbines to utilise a high grade material of phosphor bronze containing a high percentage of copper. It was found at an early stage that there is a tendency for small flaws to develop during the process of working this material into blade shapes. Blading containing such flaws, if fitted into a turbine, is a great source of danger, and a methodical system of testing and inspection of blading material has been in operation for a considerable time. Each blade, before being fixed into the turbine, is passed through the hands of a competent inspector, who examines it minutely

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for all possible defects and flaws and rejects all material where such are found. Again, at fixed periods samples of material are selected from the current stock at random and are subjected to careful test to ensure that the material possesses the expected physical properties. It is thought that this system of careful inspection has minimised the danger from what are commonly called "blade troubles" in service.

The Brown-Curtis geared turbine.

The adoption of double reduction mechanical gearing has made it possible, as has already been explained, even with very slow running propellers, to design the turbines to run at revolutions considerably higher than had been usual with a single reduction gear. With this condition it has become now largely a question of designing the turbines for the best conditions of economy as regards velocity of blading and number of elements. In 1917, Messrs. John Brown & Company completed a design of turbines consisting of H.P., I.P., and L.P. members, suitable for utilising steam at high pressure and superheated to a high degree. The manufacture of these turbines was considerably delayed owing to the necessity for giving preference to Admiralty work for war purposes, but this machinery has now been completed and is being erected in the Clydebank shops, connected to a suitable design of double reduction gear which drives a water-brake for power absorption. It is the intention of the firm to carry out extensive tests with this machinery in their plant, where arrangements have been made to supply to the turbines steam of high boiler pressure and superheated by several hundred degrees F.

The thrust block problem.

One notable improvement, incidental to development, now very widely applied and resulting in reduction in weight and space for turbine machinery, is the Michell thrust block. If this thrust-bearing had not already been in existence when the geared turbine was introduced on shipboard, it would almost have been necessary to invent it *ad hoc*. In the case of a reciprocating engine the torque on the shaft is not steady, but varies considerably in the course of each revolution. A corresponding variation occurs in the thrust of the propeller, and, with reciprocating engines, the load on the thrust block is accordingly a varying one. Owing to the elasticity of the materials of construction, there is thus a certain "breathing" action between the shaft collars and the fixed collars of an ordinary marine thrust bearing. This slight oscillation has, it turns out, a surprising effect in facilitating the lubrication of the collars. At two or more points in each revolution the thrust "lets up" a little, and the oil takes the opportunity of insinuating itself between the opposing surfaces of the thrust collars. With a turbine drive on the other hand, the thrust is almost perfectly steady, and when ordinary thrust blocks were fitted to geared turbines it almost immediately became

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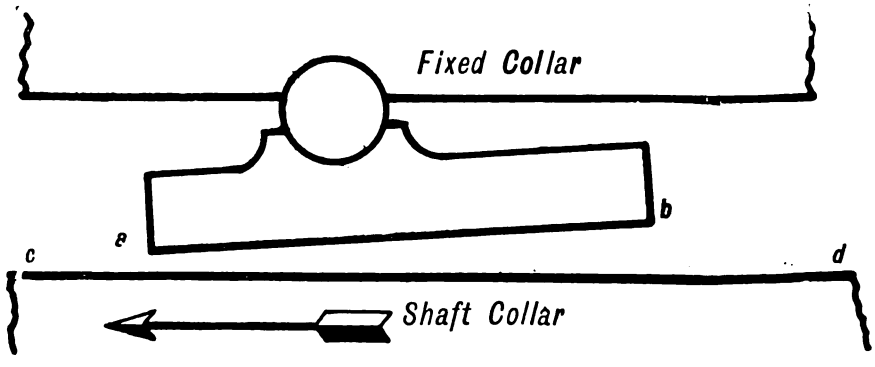
evident that the collars must not be loaded as highly as was usual in ordinary reciprocating engine practice. Here the old style of block had proved fairly satisfactory, although in spite of the oscillations above referred to, the working pressure between the opposing collars had to be kept down to a limit of about 50 lb. per sq. in. On the other hand, locomotive axle bearings can, it is found, be relied on to carry in continuous service 2½ cwt. per sq. in.

The Michell block.

This was the relative position of thrust bearings and journal bearings, when Mr. A. G. M. Michell of Melbourne patented a new type of thrust bearing. As a consequence, higher loads can be carried to-day on thrust bearings than on ordinary journal bearings, so that the position is the reverse of what it was. In some experiments, for example, blocks of the Michell type have been loaded to nearly 5 tons per sq. in., the rubbing speed being 50 ft. per second. In normal marine practice, where great prudence is, of course,



necessary, the usual load on Michell blocks is from 400 lb. to 500 lb. per sq. in. Hence the whole of the thrust can be carried on a single collar. This results in a considerable saving of material and work, and an appreciable reduction in capital costs. At the same time there is a large decrease in the frictional losses. With the ordinary multi-collar thrust block the co-efficient of friction is from 0·03 to 0·065, whilst with the Michell block, loaded to 500 lb. per sq. in. and running at a rubbing speed of 7 ft. to 8 ft. a second, the co-efficient of friction is only about 0·002; in other words, the power wasted at the thrust block is only about one-twentieth as much as with the old multi-collar type. With that the waste has been variously estimated at from 3 to 5 per cent. of the total power of the engines.

Its essential principle.

The essential principle of the Michell block will be readily understood on reference to the above diagram. Between the shaft collar and the fixed collar Michell interposes a series of little blocks,

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such as A B, which are supported by pivots on the fixed collar. These pivots bear on the block a little behind its centre. Owing to this, they tilt slightly when under load, as is indicated to an enormously exaggerated scale in the diagram. An ample supply of oil being applied to the face C D of the shaft-collar, this oil is dragged in under the block A B. As the distance between the two opposing surfaces narrows, the surplus oil is squeezed out, escaping partly at the sides of the block and partly at the front in the neighbourhood of B. The term "squeeze" implies a pressure, and such a pressure is, in fact, established in the film of oil between the surfaces A B and C D. Actual measurement has shown that within these films this pressure may attain hundreds, or indeed thousands of pounds per sq. in. Owing to this pressure the two opposing surfaces are forced apart and kept from coming into contact. There is thus no wear or abrasion, since the two never touch. Success depends upon an ample and continuous supply of lubricant, but as this can be used again and again, the actual waste of oil is much less than with the old multi-collar type of thrust block.

Progress in auxiliary machinery.

The changes in design of main propelling machinery have necessarily been reflected in the arrangement of engine-room auxiliaries. Geared turbine installations, coupled with the use of super-heated steam, have enabled the weight of steam used per H.P. to be considerably decreased. This decrease in the amount of water passing through the boiler, turbine and condenser system has not been counter-balanced by an equal decrease in the amount of steam necessary for auxiliary purposes, which has, in effect, shown a tendency to increase by the necessity for extra duties, as, for example, lubricating oil pumps in connection with the gearing and thrust services. For this reason the full utilisation of auxiliary exhaust steam for feed heating means that provision for high degrees of feed heating is necessary, and has resulted in feed heating generally being carried out in tubular apparatus rather than by direct contact before entering the hot-well. The demand for clean auxiliary exhausts free from oil has given considerable impetus to the development of turbine-driven auxiliaries, and both for main-circulating and feed-pump duties machines of this type are now becoming standard. For forced-draught fans the introduction of the turbine has been somewhat slower, but it is clearly gaining popularity. A recent development of considerable importance in principle is the Weir closed-circuit feed system, whereby the condition of an absolutely non-corrosive working fluid is obtained in the installation by isolating the feed-water at all stages from contact with the atmosphere, and retaining it in an absolutely de-aerated condition. In carrying this

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system into effect, the water is taken from the condenser by means of a water extraction pump, and is discharged through a surface feed heater directly into the suction of the boiler-feed pump. A spring loaded over-flow valve is arranged which comes into operation when the boilers are requiring less water than is being delivered from the condenser. When the boilers require more feed-water than is being delivered from the condenser, an automatically controlled valve admits the necessary make-up into the system *via* the condenser in which it is de-aerated. The vacuum is maintained by a steam air ejector, of which the exhaust is itself condensed by the feed-water thus returning all the heat to the boiler. It is claimed that this system will entirely eliminate the corrosion of boilers and piping which, in the case of small-tube boilers, has been particularly troublesome.

The heavy oil engine.

Except in connection with the submarine-boat machinery there has been little progress with the heavy oil engine. But experience during the war of this type of propelling machine must tend eventually to developments in the near future, especially if oil is found in Britain in any large quantities. The two-cycle system has not made greater advances than the four-cycle system, notwithstanding its inherent advantages. The larger the power, it is generally admitted, the better is the case for the two-cycle principle, because (1) the size of the exhaust valve possible for four-cycle engines is limited; (2) the two-cycle engine has a better turning moment; (3) the two-cycle engine requires a smaller cylinder to develop equal power in the same number of cylinders, although at a higher consumption of fuel per unit-power developed. Furthermore, the Diesel principle removes some of the most weighty objections to the two-cycle principle. The scavenging with two-cycle Diesel engines is carried out by air alone, instead of by a mixture of air and gas, so that the danger of ignition of the incoming gas, or of the loss through the exhaust ports of part of the charge, does not arise. The foregoing are the points around which discussion has generally centred.

Two- versus four-cycle.

The practice hitherto of makers of Diesel engines has varied. Some few have stood firmly by the two-cycle system throughout a large range of power; others have confined themselves exclusively to the four-cycle engines, whereas a few of the largest manufacturers build four-cycle engines up to a maximum of some 200 to 250 B.H.P. per cylinder, and construct only two-cycle engines above that power per unit, on the assumption that the higher the cylinder power the greater the attraction to the two-cycle engine. Moreover, for special work, where lightness and compactness are of the highest importance, such as for submarine work, the two-cycle engine has been credited

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with a greater capacity for fulfilling these requirements than the four-cycle engine, and theoretically, looking superficially at the subject, the doubling of the number of impulses achieved by the two-cycle principle should have justified this choice. The attempt to make a final adjudication from the results to date of two- and four-cycle practice, without having reliable knowledge of all the facts, would simply open the way to a lengthy and probably useless controversy. It may be stated, however, that the two-cycle engine has not gained ground; in fact, the four-cycle, if anything, even for higher and higher powers, is increasing in application and the claims to compactness and lightness of the two-cycle engine have not fully been substantiated by the results of actual practice.

Size of cylinders.

For two-cycle engines for merchant ships the most at which a cylinder has been rated is under 400 B.H.P. Others are of 300 B.H.P. In the case of the four-cycle engine the highest power per cylinder for ships in service is still less than 400 H.P. Some of the German submarine boats have engines with 300 H.P. cylinders, while in the British submarine boats, which are practically all fitted with the Vickers engine, the power is nominally 100 B.H.P. per cylinder, although 150 B.H.P. has been got out of them. Here, however, the aim has been reliability rather than high power per unit of weight. Light weight can be obtained either by decrease of reliability and endurance, or by the use of expensive materials and methods of manufacture. Thus there is nothing, from one point of view, against a number of engines of aeroplane type geared to a submarine propeller shaft, but this would not commend itself to service experience. Remarkably light weights have been claimed for continental submarine Diesel engines from time to time, down to 40 lb. gross, but it is difficult to obtain confirmation of them, or to ascertain exactly what is comprised in the weight. It is known, moreover, that some of these engines have failed on account of their lightness. There is a suspicion that many of these weights are based upon I.H.P. not B.H.P., which may be only 70 per cent. to 80 per cent. of the former, and that the power is that produced during short trial "bursts." The British standard engines may be regarded as reliable sturdy engines, and while some reduction in weight could be made, any marked decrease would be at the expense of reliability and ability to withstand rough usage. On a conservative rating, the weight for the eight-cylinder design would be 58 lb. per B.H.P. These engines are capable of taking a considerable overload, and the rating could reasonably be made 52 lb. for the engine alone. The ten-cylinder engine weighs about 8 per cent. less per B.H.P. With special fittings these engines have been made slightly lighter, and have been run up to 150 B.H.P. per

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cylinder, bringing the weights down to 38·5 lb. per B.H.P. It is doubtful, however, if in the first place these engines would then be equally satisfactory on service and, secondly, if it is necessary for submarine purposes to reduce weights to this extent. The conditions are very different from those appertaining to surface craft and are difficult to meet exactly; what is more often desirable is a reduction in the weight of the shipbuilders' top hamper. Generally speaking, the last few years have resulted in specially light weight in submarine engines being recognised as a feature not very important, except as indicating the likelihood of trouble on service. For the larger engines the deadweight becomes more important, and in such cases it is necessary to design the boat to accommodate the weight and space of the engine when such are determined, and not *vice versâ*.

British submarine engines.

In British submarine boats there has been practically a standardisation of cylinder, as indicated already, of 100 B.H.P., and eight or twelve cylinders are adopted in each set, while two or three sets, each driving separate screw propellers, are installed in each boat. Thus, one type of submarine boat is fitted with treble engines and propellers and thus has attained the exceptional high speed of 18 knots on the surface. The cylinders are, as a rule, of 14½ in. diameter by 15-in. stroke, and the 100 B.H.P. is attained with 350 revolutions per minute. The consumption of oil per B.H.P. is about 0·4 lb. per hour and as low as 0·381 lb. has been attained. One or two points in the design may be noted. The first is the measure of accessibility gained by built-up plates forming the column construction. This renders it possible for engines to be maintained and refitted by ship or depôt staffs without calling in dockyard or manufacturers' assistance. The second is the conservative rating and stresses. Thereby extreme durability is obtained and serious breakdowns are avoided. The weight per B.H.P. of an engine should always be considered in connection with the rating and stresses allowed. The Vickers' construction is in principle a very light one, and even with the low rating adopted the weight per B.H.P. is 56 lb. for the bare engine, calling the power 1200 for the 12-cylinder engine. This weight is reduced to below 50 lb. if the power be taken as 1400 H.P., which is easily obtained, and would be very materially decreased if the piston speed were increased to the high figure of 1323 ft. per minute, as is obtained in some of the German U-boat engines. The third notable feature is the avoidance of special methods of manufacture. While the best material and workmanship are used, special steels are avoided, as also is the heat treatment of details and the use of parts requiring very special tools or process of

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manufacture. Thus spur wheels are used wherever possible in preference to helical gear. The engine thus becomes an ordinary manufacturing and refitting proposition, and no danger arises if a broken part is replaced in ordinary material. Such a policy permits boats to be sent to foreign stations with more assurance than if they were dependent for upkeep upon expert supervision during repair. Finally, simplicity and safety are studied. All adjustments are obvious and readily carried out.

"Solid fuel injection."

A notable feature of recent oil engines is the adoption by the Vickers Company of fuel-oil injection by mechanical means, obviating the use of air-compressors for air-injection of the fuel. This reduces weight and complications and minimises danger. It will be remembered that the salient feature of the Diesel engine is that the pressure of the air within the cylinder is on the up-stroke of the piston, raised to such a degree that the temperature is sufficient to cause ignition when oil is introduced, instead of ignition by electric spark as in other types of oil engines. Normally in Diesel engines the oil is sprayed into the cylinder by highly compressed air, but the Vickers Company have introduced a mechanical oil injection system which requires simply a high-pressure pump supplying the fuel to a main pipe from which a definite amount is admitted each firing stroke by a measuring valve in the cylinder head; this measured quantity passes to a simple spraying nozzle. The power is controlled by varying the duration of the opening of the spray valve and at the same time adjusting the pump to the pressure required. Years of trial have been necessary to obtain the results now achieved, but in its present development the injection is reduced to the simplest possible terms. This system has been adopted now in engines of a total B.H.P. of 390,000, a proof of its efficiency. Practically all the Vickers submarine engines are so fitted.

German submarine engines.

The engines of the later German submarines are of the M.A.N. (Maschinenbau Actiengesellschaft Nürnberg) type. It is understood that the two-stroke engines did not prove successful, and were discarded in favour of the four-stroke engines. This is interesting in view of the prominence given by the Germans to their two-stroke designs in pre-war days. The four-stroke engines are fitted with six cylinders, and the standard sizes were of 1750, 1200 and 550 B.H.P. When used for propelling submarines the engines were made reversible, but in some cases, where smaller engines were used for charging electric accumulators, the reversing gear was omitted. The diameter of the cylinder in the larger engines is 20·86-ft., the stroke being the same, and full power was developed at 380 revolutions per minute. It will be observed that the stroke-bore ratio, probably on account of

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a desire to save head room, is less than is the usual practice; the high power has been obtained by the use of piston speeds, extraordinarily high for this type of engine. The engines, judged by short runs, appear to have worked well, but when run for any length of time at full power considerable wear was experienced, owing to the high bearing speeds. It is generally understood that a considerable percentage of the boats have been out of action at times owing to machinery defects. The policy in design and construction was to regard the installation as almost automatic, and when trouble arose the boats had to be handed over for expert attention. Indeed, in some cases the entire machinery was removed and new engines substituted; the crew in the meantime being transferred to another boat. Little or no attempt was made to effect repairs by the crew; lack of accessibility for supervision or overhaul lends support to this view. The full-power consumption of these engines is said to be about 0·44-lb. per B.H.P. per hour, which is 15 per cent. above that of the latest British 1200 B.H.P. submarine engines.

Aircraft engines.

Something may finally be said about the engines for naval aircraft. The tendency during the war, and particularly during the latter part of the time, was to produce bigger and bigger engines, both as regards size of cylinder and total H.P. In the early part of the war most of the British aeroplanes were equipped with engines of 100 H.P. or less, whereas the Handley Page is fitted with four 500 H.P. engines, and at the close of the war arrangements were being made to manufacture engines of 500 and 600 H.P. each. The early engines had mostly eight cylinders, the later twelve cylinders. The mean effective pressure calculated from the B.H.P. has during the war period risen from approximately 90 lb. per sq. in. to 120 or even 130 lb. per sq. in. The weight per H.P. of the latest type of engine has not decreased very much. For the engine dry (without lubricating oil, petrol, water, etc., in the pipes) it is between 2 lb. and 3 lb. per H.P., but it must be borne in mind that it is more difficult to keep the weight per H.P. the same in a large engine as in a small one, so that the increase of engine size has rather disguised the improvement in weight reduction. The lightest engine is probably the A.B.C. Dragonfly, which is an air-cooled engine developing 320 B.H.P. and weighing something under 600 lb.

Effect of altitude on aero-engine power.

As regards fuel consumption, aero engines are in general more economical than motor-car engines, and the fuel consumption varies about 0·55 to 0·6 pints per B.H.P. hour at full load. As to the effect of altitude on engine power, it is of course obvious that the reduction of air density at high altitude will reduce the power of the engine in direct proportion, and when it is considered that at 10,000 feet—a

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not uncommon altitude—the atmospheric density is very much less than that at sea level, it will be seen that a very important consideration is involved. In the official tests the air density is halved at 21,000 ft. standard height (22,400 ft. aneroid reading). Latterly, it has been recognised that a full-power test at ground level of any considerable duration is an unnecessary and inadvisable test for an aero engine, as such a run is never necessary in practice, and that in making the lightest possible engine for the actual conditions of flight it is impossible to design it so that it will run with the throttle full open for any long period at the ground level. For example, at high altitudes it has been found that a high compression is advisable, and it is now usual to make the compression so high that the engine pre-ignites after running full out on the ground for a short time; although, owing to reduction in air density, it does not misbehave in this way in flight. A common compression ratio for aero engines is now as high as 5·4 to 1, and this combined with the high volumetric efficiency means a very high compression pressure, comparing with the normal engine having a compression ratio of about 4 to 4½ to 1 with considerably less volumetric efficiency. It is, of course, these two factors which have continued to maintain high mean effective pressures with increasing size of cylinder and power engines.

It will thus be seen that the British engineers have played their traditional part in the development of naval engineering. Consistently with the national characteristics, they have played for safety rather than for sensational results, and thus it has been found throughout the operations of war that the Executive Officer could usually rely upon reaching his objective at the best speed possible. There is hope, too, for the future, whether as regards the propulsion of ships on the surface, or under the water, or in the air. The lessons of the war, so far as machinery is concerned for all three types of naval vessels, have been carefully collated, and they must be fruitful for further progress in the future.

ALEX. RICHARDSON.

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CHAPTER VI.

The Submarine War on Merchant Shipping.

Pre-war theories.

In considering the anti-submarine campaign during the war it is necessary to recollect that the action of the enemy against merchant shipping was not contemplated until it actually occurred. The law of the sea amongst all civilised nations has been hitherto that neutral merchant vessels may not be captured until they have been examined to see if they are carrying contraband, and that every merchant vessel, whether enemy or neutral, must be summoned to stop or surrender before being fired at. The usual procedure was to fire a gun across her bows as a signal to her to stop; she was then boarded and her papers examined. If there was a *primâ facie* case against her a prize crew would be placed on board, and she would be sent into one of the captor's ports for adjudication by the Prize Court. In the event of it being impracticable to send her into port, her crew, passengers, and papers might be removed and the vessel sunk; but the circumstances still came before the Prize Court, and if she had been wrongly sunk the captor would be condemned to pay damages, while even if he were considered justified he had a barren victory.

In such circumstances the damage a submarine could do to trade was negligible, as she neither had a sufficient crew to place prize crews on board nor accommodation for the crew and passengers of captured vessels if she sank them. The *rôle* of the submarine in war was therefore considered to be confined in practice to attacking an enemy's fleet, and the preparations made by us before the present war were based on this idea.

German practice.

The Germans got over these difficulties by sinking anything they could, without examination and without regard to the lives or property of non-combatants or neutrals. If an enemy cruiser had fired at and sunk a merchant ship without warning, or without removing her crew and passengers, it would have been considered a criminal act. Had the merchant vessel resisted she would, of course, have had to take the risks until she surrendered, but immediately she surrendered it would be the duty of the cruiser to save those on board. Presumably the German argument was that, as submarines could not do this, they were entitled to attack and sink without warning and without regard to the lives of the non-combatants; but it is difficult to see how such action can be considered legitimate warfare in the case of a submarine if it would be illegitimate in the

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case of a cruiser. The rules in question were evolved for the protection of non-combatants, not for the benefit of belligerents.

Torpedoing without warning.

The action of the enemy in the early months of the war shows that the Admiralty assumption was justified. The first British merchant vessel attacked by an enemy submarine was a small steamer of 866 tons, which was captured and scuttled 14 miles from the Norwegian Coast on October 20, 1914. In November two steamers were captured and sunk by gunfire. In December one steamer was chased by a submarine but escaped, and on January 21, 1915, one was captured and sunk with bombs. In none of these cases was there any loss of life. On January 30, 1915, however, the enemy's practice changed, and three vessels were torpedoed without warning, twenty-one lives being lost. None of these vessels was armed, and it would, therefore, have been perfectly safe for the submarine to have summoned them to surrender. From this date onwards until the Armistice was signed this practice was continued. During the two years between February, 1915, and February, 1917, 27 per cent. of the vessels sunk by submarine were torpedoed without warning; "ruthless" warfare then commenced, and this system became the rule. Thus for nearly six months after war was declared the enemy adhered to the previously accepted rule of civilised warfare, and proved, as the Admiralty has anticipated, that submarines could do little harm to trade under such conditions. The enemy having then discarded all recognised rules our task of dealing with new conditions began.

The most glaring case occurred in May, 1915, when the Lusitania, an unarmed passenger ship, was sunk without warning, and nearly 1200 lives were lost. In this instance there was clearly no risk to the submarine in coming to the surface and summoning the vessel to surrender, and nothing more deliberately horrible or less in accordance with the rules of sea warfare could possibly have been carried out by the most piratical nation that has ever existed. Subsequently several hospital-ships were torpedoed in an equally shameful way; but this does not come within the scope of the present chapter. Even, however, if summoning vessels to surrender and examining their papers involves risk to a submarine, this is no excuse for sinking them without this procedure. Every vessel making an attack in war must take some risk, and the vulnerability of submarines on the surface, though it may be an argument against their use in this way, affords no grounds for exempting them from the recognised rule.

Excuses of the enemy.

Two actions on our part have been suggested as affording the enemy an excuse to change his procedure. Neither of them can justify it, but it is as well to examine them.

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Arming merchantmen.

The first is our arming of merchant ships. There was nothing new in this. Merchant ships have been armed and have used their armament in previous wars. The rule here is that the merchant ship is armed for defence; she must not be the aggressor. If attacked she may use her armament, but she then takes the risk until she surrenders. As soon as she surrenders it is the duty of her antagonist to save life. The first attack on an armed merchant ship by a submarine was in March, 1915. This vessel was captured and set on fire, but was afterwards towed in by our own vessels. In April another armed vessel was chased, and escaped by using her gun. Both these cases were a long time after torpedoing without warning was instituted, and cannot therefore be claimed as a reason. Moreover, so careful were the Admiralty to avoid any chance of the merchant ship becoming the aggressor that the gun was invariably placed aft, so that the ship would have to turn her stern to the enemy before she could fire.

Decoy ships.

The second action which has been suggested was the use of Q ships. Some of these were merchant ships taken up for the purpose, others were specially built. Their purpose was to act as decoys with a view to bringing a submarine to action. There is nothing new in this, for the use of disguises and false flags to draw the enemy on is of ancient date, and has been practised frequently in past wars. It is only what everyone expected from the first day of the war, and was practised by the Emden and other German vessels before any Q ships were fitted out. It was also adopted by German merchant vessels in the early days of the war, by German raiders escaping through the North Sea, and by submarines who hoisted sails and used false navigation lights.

The well-known rule regarding this practice is that any disguise, even the use of neutral or enemy colours, is lawful, but that a disguised ship must hoist her own colours before opening fire. This rule has been strictly adhered to throughout the war. The first Q ship was commissioned on November 29, 1914. She was a failure and was paid off early, never having seen a submarine. The next was commissioned on January 27, 1915, and did not sail until after the 30th. The first action in which a Q ship was concerned was June 5, 1915, so that, though it is possible Germany knew from spies that we were using or proposing to use such ships, nothing that they did could have influenced her in any way.

The real reason.

There can, however, be no doubt that the real reason for this piratical action of the enemy was that by the end of December, 1914, eight of the eleven German cruisers and armed merchant ships which had been preying on commerce had been sunk or rounded up, and

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the enemy's chances of interfering with our trade by this means had definitely failed. Submarines used in a civilised way had proved to be of no value against merchant ships. The only hope for Germany to affect our trade was to follow at sea her military system of teaching "kultur" by applying the gospel of "frightfulness."

Pre-war experiments.

The fact that before the war an attack by submarines on merchant shipping was not considered a practical danger does not mean that methods of combating submarines had been neglected. In the early part of 1910 a committee had been appointed by the Admiralty to consider this matter, and sat continuously until after war was declared. This committee conducted many experiments, and proposals or early forms of nearly all the methods in use during the war had been before it. Mines, nets, grenades, time-fuses for under-water explosions, sweeps, towing-charges, smoke-screens, smoke-shells, misleading painting and zig-zagging, were all brought forward, and many of them developed to a considerable extent. As, however, the submarine's objective was held to be the Fleet, these methods were judged by the possibility of their use by, or for, the protection of naval vessels.

Work after outbreak of war.

The enormous number of small craft required for the protection of trade against enemy submarines working on anti-civilised lines was naturally enough not realised, and we started the war with fourteen trawlers fitted for mine-sweeping only. By its end we had over 3000 auxiliary patrol vessels including trawlers, drifters, yachts, motor-launches, etc., apart altogether from the cruisers, armed merchant vessels, destroyers, and other escort vessels engaged in protecting the trade routes; while in addition to our own vessels there were others belonging to the French, Italians, Japanese, Americans and Greeks. The whole of the organisation for this, as well as providing the vessels themselves and their equipment, had to be evolved after war was declared, and we had to assist our Allies as well as completing our own requirements, though, as a matter of fact, we were still far short of the requisite numbers when the armistice was signed. Bases had to be fitted up, and arrangements made for fuelling and repairs, taking up, converting, building and docking, the provision of guns, nets, depth-charges, mines, and other apparatus in very large quantities, the training of *personnel*, scientific experiment and research, the enrolment and training of crews, and for meeting the developments of the situation from day to day. The arming of merchant ships and providing them with the defensive apparatus, the organisation of the convoy system, and the training of their officers and crews had also to be undertaken. Had it been possible to publish what was actually being done there would have been less

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criticism of the Admiralty, and fewer claims from inventors for having designed apparatus which had been tried and rejected years beforehand or which had been developed and were in actual use at the time. In the end, however, the submarine menace had been controlled and reduced to manageable proportions, even if it had not been eliminated. The submarine was beaten unless something new was developed.

It must not be supposed that the final form of either organisation, tactical use, or actual description of apparatus was that first brought into use. Ideas had to be developed by many experiments before they could be employed practically, and even then there was progressive development and frequent change as new vessels or apparatus became available or as experience proved to be necessary. For instance, both for auxiliary patrol and merchant vessels only very few guns, and these of the smallest calibre, were available. These were first mounted in the most important vessels, and afterwards superseded by larger types, the smaller sizes being transferred to smaller ships. Again, the early type of listening apparatus was of low efficiency and non-directional; but later a directional hydrophone was designed and added to the equipment. Later, still further improvements were made, and a directional apparatus evolved which could be used with the vessel moving. When, therefore, the number of vessels fitted with any apparatus are compared at different periods of the war, it must be borne in mind that as their efficiency was progressively increased numbers alone are insufficient for comparison and give little idea of the actual work done.

British losses during the war.

There were distinct phases in the war, one of which has been mentioned above as extending from the commencement to January 29, 1915, during which no torpedoes were used against merchant ships, every vessel being first captured in the regular way. This resulted in the loss of only four British merchant ships by direct submarine action and no loss of life. Fourteen vessels and sixty-nine lives were, however, lost by mines, nearly all outside territorial waters, while fifty-one vessels were captured or destroyed by cruisers.

The next phase lasted for two years, until February 1, 1917, our losses by the direct action of submarines being 544 vessels, or rather over twenty-two a month on the average, and 3066 lives, including 1198 in the Lusitania, 104 in the Falaba, 132 in the Royal Edward, and 334 in the Persia. Of the above, 269 vessels, or very nearly half, were sunk by torpedo, 148 of them without warning. This is equal to 27 per cent. During the same phase 129 vessels were damaged with some loss of life.

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The third phase covers the remainder of the war—the period of "ruthless" or "unrestricted" submarine warfare. This differed more in degree than in kind from the second phase, in that torpedoing, nearly always without warning, became the rule, other methods being gradually superseded. This phase may be sub-divided into three parts:—

(*a*) The period up to the date when the convoy system was in full swing.

(*b*) From then to the blocking of the Belgian ports.

(*c*) The last few months.

The Convoy System was really started early in 1917, but it was not in full operation on the Atlantic routes until September of that year.

The first period of the third phase may, therefore, be taken as lasting from February 1 to August 31, 1917. During these seven months we lost 736 vessels by direct submarine attack, an average of 105 a month, or five times the rate of loss in the second phase. Of these 572, or nearly three-fourths, were torpedoed, 505, or 69 per cent., having been sunk without warning.

The second period of the third phase extended from September 1, 1917, to the end of April, 1918, or eight months. In this period 548 British merchant vessels were sunk by direct action of submarines, or an average of sixty-eight a month. Of these 448, or 82 per cent., were torpedoed, all but four without warning.

In the last period of the third phase—*i.e.*, from May 1st to the date of the Armistice, nearly six months—the total number of our vessels sunk by submarine was 252, or forty-two a month. The number of these sunk by torpedo was 228, or 91 per cent., no warning having been given in any case.

Vessels sunk and submarines destroyed.

Perhaps the best way of bringing home the difference in these phases and the mastery we eventually obtained over the enemy is to compare the number of vessels sunk by enemy submarine or mine with the number of submarines destroyed in each period. The submarines destroyed by the enemy to avoid capture on the signing of the Armistice and the vessels and submarines damaged are omitted. The figures are as follows:—

	Vessels sunk per submarine destroyed.	
	British Merchant Vessels.	World.—British and Foreign Merchant and Fishing Vessels.
1st Phase	2·6	10·4
2nd „	15·4	48
3rd „ (*a*)	27	67
(*b*)	10	20·2
(*c*)	5·3	12

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Convoy.

These figures show that from the time the convoy system was in operation the failure of the "ruthless" plan of campaign was certain. They also show that during the last six months of the war a submarine was of little more use to the enemy than during the first six months, when their impotence induced him to abandon the restraints of civilised warfare, and that, notwithstanding the larger number available, he could never hope to have enough to defeat us. He had gambled with his resources and lost.

Types of submarines.

The submarines we had to contend with were of several types. The smallest was the U C—a minelayer of about 160 ft. long, which could remain out from seven to fourteen days, and usually operated in the North Sea and English Channel. This class had a maximum speed of 12 knots on the surface and 7 knots submerged. The U B class was rather larger, about 180 ft., and could remain out fourteen to twenty-four days, which enabled them to operate further from their base. These submarines carried about ten torpedoes, and were armed with a 4-in. gun. Their maximum speed was 13 knots on the surface or 8 knots submerged. The U-boat was a large class, mostly fitted with torpedoes, but some for laying mines. They were about 220 ft. long, with a maximum speed of 16 knots on the surface and 9 submerged. They could remain out twenty to thirty days, and were armed with a 4-in. gun. The converted mercantile submarine cruisers were armed with two 6-in. guns, were over 300 ft. long, and could remain at sea for three or four months, but their speed was no greater than that of the U-boats. Considerably larger U-boats and cruisers were coming along at the end of the campaign. The maximum submerged speed given above could not be kept up for more than an hour, and could only be used in practice for a much shorter time, as if the batteries were run down the submarine would have to come to the surface. The usual under-water speed seldom exceeded 3 or 4 knots.

Procedure of submarines.

Contrary to the popular idea, a submarine spends most of its time on the surface and only submerges when there is danger or she wishes to make an attack. This operation could be carried out in less than a minute, and under favourable conditions it would be possible to remain under water up to forty-eight hours, if necessary.

Passages were necessarily made on the surface, and the usual speed was about 9 knots. When on the hunting grounds a submarine would usually lie on the surface with engines stopped or running slowly, for by keeping a good look-out they could be sure of seeing before being seen. The smoke of a steamer can be seen in clear weather up to 15 miles, and of a convoy somewhat further, so that after sighting it was comparatively easy to get ahead of the target on

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the surface without being seen. When the desired position had been reached, and the steamer was 4 or 5 miles off, so that there was a risk of the submarine being seen, she would dive, and after that would only show about 2 ft. of her periscope for 5 or 10 seconds at a time. As this part of the periscope is only about 2 in. in diameter it will be realised that the chances of seeing it before the submarine is within torpedo range is slight.

It should also be remembered that a submarine is not out to fight. If there is appreciable risk she will wait for another opportunity. Of course, some commanding officers would take more risks than others, and would succeed where others failed, but knowingly taking risks was confined to a few. Towards the end of the time there were signs that the *moral* of the crews was not what it had been, and, indeed, this was only to be expected, for our methods of dealing with them were continually improving, and their losses were increasing.

Counter measures.

Having now dealt with the changing circumstances which had to be met at different periods of the war, and with the craft we had to deal with, it is advisable to review the various counter measures which we employed to combat the menace to trade and shipping. These may be divided into major operations and local measures, or the tactical employment of various apparatus.

The four major operations which had effect over large areas were:—

1. The arming of merchant ships.
2. The introduction of the convoy system.
3. The mine or net barriers in the Straits of Dover and Otranto, and in the North Sea.
4. The blocking of the Belgian ports.

The effect of 3 and 4 falls within the scope of this chapter; the actual operations do not.

Arming merchant ships.

The arming of merchant ships was commenced in 1915, but at first few guns, and those only of small calibre, were available. By the end of 1916, 1337 vessels had been armed; a year later this had increased to 3193, and in September, 1918, it had risen to 4139. During the early part of the time, in order to make the guns go as far as possible, it was the practice to remove them from outward-bound vessels at certain ports well outside the submarine area and mount them in homeward-bound vessels. Later on, as larger guns became available, they were placed in the larger ships which had previously been fitted with small guns, and the latter were then mounted in smaller vessels. By the date submarine warfare ceased, some 60 per cent. of the guns mounted in merchant ships were of 4 in. and

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above. If a comparison be made between British vessels, which were mostly armed, and foreign vessels, which were mostly unarmed, it will be seen that armed vessels had a considerable advantage. Taking the period from February, 1917, to October, 1918, the figures are :—

	British. Per cent.	Foreign. Per cent.
Average percentage of attacks by gun to total attacks . . .	13	27
Average percentage sunk of attacks made by torpedo. . . .	59	73
Average percentage sunk of attacks made by gun	25	66
Average percentage of total sunk to total attacked	54	72
Average percentage of escape without loss or damage . . .	34	20

It would seem from this that armament increased the ships chances by something like 20 per cent.

Convoy system.

Before the convoy system was introduced steamers trading oversea were specially routed, but the time required to inform them of a change of route and to divert them was necessarily considerable. In effect, when a submarine had discovered the new route she had ample time as a rule to do a considerable amount of damage before it could be changed again. The first sailings in convoy under protection were vessels engaged in the French coal trade, and during the war nearly 38,000 vessels have sailed under these circumstances with about 30,000,000 tons of coal for France, and with a loss of only 0·14 per cent. A second route which was developed on slightly different lines was the Scandinavian trade. Between 10,000 and 11,000 vessels were convoyed during the war on this route with a loss of 1·2 per cent., mainly caused by two attacks by surface vessels.

In May, 1917, the first homeward Atlantic convoy was brought in, and the system was gradually extended until eventually over 90 per cent. of the oversea trade was convoyed. During the first six months of "ruthless" warfare the losses in British and foreign vessels, trading oversea with the United Kingdom, averaged sixty-seven per month in the Atlantic and approaches to the western coast of the British Islands. Six months later they had declined to eleven, a saving of 83 per cent. on those routes. There can be little doubt that this system entirely upset the enemy's plan to starve us out. The amount of organisation required and the difficulties of putting the system into practice were very considerable, and can hardly be realised except by those who actually carried it through. There was at first some fear that the interference with trade would do more harm than good, by delaying sailings and by preventing the faster ships making use of their speed. Moreover, as the masters had no experience of working in squadrons the danger of ships steaming in company without lights was thought to be considerable, especially during simultaneous changes of course while zig-zagging, or if

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attacked. The manner in which Mercantile Marine officers surmounted these difficulties deserves high praise, especially when it is considered there were nearly always foreign vessels in the convoys. Instruction courses were organised at the principal ports through which a large number passed, and this was of great advantage.

The effect of the convoy system on the submarine was (*a*) to make it difficult for her to find a target, and (*b*) to add considerably to her danger when making an attack. As a corollary to (*a*) the operations of the larger submarines were greatly interfered with by compelling them to work nearer the coast. Owing to the ease with which ships could be routed, it was henceforth of little use for a submarine to wait where she had seen a ship pass in the expectation that within a few hours others would follow. Each convoy was surrounded by a destroyer screen for a considerable distance out from the coast, and this screen was supplemented nearer in by patrol vessels and, when weather permitted, by aircraft. An enemy attacking a convoy was therefore certain to be counter-attacked in a very few minutes after showing himself, and his difficulties were correspondingly increased in making an attack. Large submarines dislike the risk of diving in shallow water, and prefer to keep well away from the land. Before this they had been able to proceed outwards along the trade routes and attack ships 300 and 400 miles from the coast. Convoys, by ignoring trade routes and taking different courses each voyage, made it impossible for submarines to find them so far out except by chance, and the latter had therefore to close in where the routes must converge, where they were more liable to be counter-attacked, and their larger size was a disadvantage. That they would be driven closer in was, of course, foreseen, and the distance it was necessary to provide a destroyer escort for convoys was arranged accordingly.

The actual formation of the convoys, the disposition of escorts and the methods of zig-zagging, were modified by experience, and the whole system was brought to a most efficient state in a remarkably short time; but there were always some ships which could not be brought into the system, and a considerable number who, for part of their voyage, were unconvoyed owing to their Home ports being scattered.

The grand total of vessels convoyed during the war under British organisation reached nearly 90,000, with a loss of 436 vessels, or less than 0·5 per cent., a sufficient proof of the efficiency of the system.

The permanent improvement in the rate of mercantile losses round the British Coasts coincided with the barrages in the Straits Barrages.

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of Dover and the North Sea, and with the blocking of the Belgian ports. How much is attributable to each it is impossible to say, as the three operations took place within a short time of each other. For seven months beforehand the losses (British and Foreign) had averaged fifty-six a month, afterwards they fell to an average of twenty-nine, so that the combined effect was to reduce the losses round the coast by twenty-seven vessels a month, or forty-eight per cent.

Mediterranean.

In the Mediterranean it is difficult to separate convoy from coastal losses. Taking the situation as a whole, and comparing the Mediterranean with the Atlantic and British Coasts combined, the reduction is nearly in the same proportion.

	Average sinkings per month, British and Foreign.	
	British Coasts and Atlantic.	Mediterranean.
Feb., Mar., Apr., 1917	130·1	33·3
Aug., Sept., Oct., 1918	38	11
Reduction	71 per cent.	67 per cent.

Local measures.

The counter measures dealt with above affected large areas, and their effects can be traced, but there were many of a local nature which also had a considerable effect. Some of these were permanent, such as booms and minefields, others were temporary, *e.g.*, concentration of vessels, lines of nets, or our own submarines on patrol duty. Others again were of general use, such as hydrophones and depth charges. Speaking generally, the effect of these measures was to relieve the pressure when they were applied, in some cases by destroying the submarine, and in others by making him move elsewhere.

Patrols.

Traffic round the coast was protected by a system of patrols, and was obliged to follow prescribed routes, which were varied from time to time, and sometimes closed for short periods when a submarine was known to be in a particular area. The closing of a section of any route could not, however, be continued for any length of time, and it was generally necessary in such cases to divert the traffic. In some sections where the enemy laid a great many mines a channel would be swept through them, leaving those outside the channel as a screen through which if an enemy passed he was liable to be blown up. Against mines the most effective protection was sweeping, and as an indication of the success with which this was done it may be mentioned that, for the six months ending September 30, 1918, only

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two British merchant ships were sunk off the British Coasts by this means. During the war nearly 10,000 mines were swept up in Home waters.

Before describing the various minor measures it is advisable to indicate the system under which they were employed or maintained. To this end it is necessary to consider the organisation of bases and the supply of *personnel* and material.

Base organisation.

During the war, between forty and fifty bases and sub-bases were established for anti-submarine purposes round the coasts of the United Kingdom. These bases had to be provided with *personnel*, accommodation for staff and stores, recreation rooms or canteens for the crews. Arrangements had also to be made for hospital treatment in cases of accident or sickness, and for the docking, repair, refitting, and refuelling of the vessels attached. These bases were grouped into twenty-two areas, each under the Commander-in-Chief of one of the Naval ports, or of Senior Naval Officers specially appointed. Each area had its own arrangements for the instruction of officers and men in the technical and tactical use of the various forms of apparatus supplied from time to time, such as guns, hydrophones, depth charges, and howitzers. It will, therefore, be realised that not only was a large staff required, but that an effective organisation was necessary for dealing with the numerous problems presented, which varied in almost every base.

In general, the staff was divided into two main branches, which were co-ordinated under the Commander-in-Chief or Senior Naval Officer. These were the Operations Branch and the Administrative Branch. The Operations Branch dealt with plans of operations, drafting of orders, movements and protection of mercantile traffic, including convoy escorts, the system of communication by telegraph, wireless, signals, etc., and Intelligence work, such as sifting and distributing information regarding enemy movements. Under the Administrative Branch came internal economy, discipline, pay, clothing, provisions, recreation, leave, mails, etc., also technical training and inspection, refit and repairs, stores and equipment, fuel and contracts. The staff necessarily varied in numbers with the size of the base, and the distribution of duties with the size of the staff. In some bases one part of the work, *e.g.*, arranging convoys and escorts, would be by far the most important, while in another it might be mine-sweeping or tactical operations. The organisation can therefore only be given on general lines, for when the staff was small, or one of the duties predominated, the grouping of work had to be varied to suit. Each area was in touch with adjoining areas, and with the Anti-Submarine and other Divisions of the War Staff

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at the Admiralty, and as regards the Administrative Branch, with corresponding departments on the Controller's side at the Admiralty.

Personnel. With the exception of a few naval officers the bases were manned from the R.N.R., R.N.V.R., W.R.N.S., and the shore population of the neighbourhood; while afloat the R.N.V.R. and Trawler Reserve furnished the greater part of the officers and crews of the Auxiliary Patrol vessels. The manner in which all pulled together, and not only learnt their work but carried it out under all sorts of difficulties, must have been seen to be appreciated. When it is recollected that the great majority had been under no sort of discipline before the war, that the work was entirely new to most of them, that many of those at sea had never been brought up to that profession, and that the idea of women working with seamen at the bases had not been entertained before the war, it speaks well for everyone that the work was done well, and stuck to month after month and year after year. The work of the W.R.N.S. was by no means confined to the lighter occupations, many of them having been employed in fitting depth charges and wire nets, and even in boiler cleaning.

Auxiliary Patrol. By far the greater number of the crews of A.P. vessels belonged to the fishing fleet, who manned the trawlers and drifters. The majority were employed round the British Coasts, but there were considerable numbers in the Mediterranean and smaller numbers in other parts of the world, such as the Arctic. Next in numbers were the R.N.V.R. crews of the motor launches, who were largely recruited from yachtsmen and others used to boating for pleasure, or having scientific or technical experience in electricity or with petrol engines. A considerable number had never been in a boat before. Several admirals on the retired list dropped their naval rank and accepted commissions as captains, R.N.R., to command yachts, and later took charge of convoys or were appointed in charge of bases. This had, no doubt, a great effect on those serving with the Auxiliary Patrol and helped to establish the general good feeling which existed. In most bases a good deal was done for the comfort of the men when off duty by local associations of ladies, who, with the support of the senior naval officer, established canteens, libraries, warm clothing clubs, etc. In some cases provident funds were established, and in every case much was done to encourage *esprit de corps*.

Instruction in gunnery and in the use of the various apparatus was given by means of drill and lectures. Tactical schemes were explained to officers, and discussions or suggestions welcomed and considered.

Material. As with men, so with vessels, the backbone of the Auxiliary Patrol was the fishing fleet, trawlers and drifters. Most of those in

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existence before the war were gradually taken up, and all new vessels were absorbed as soon as completed. In order to expedite construction the Admiralty took over the whole of the output, standardised the types and provided the material. In 1916, the first motor launches were delivered, coming over as deck cargo from Canada and the United States. Over 500 of these vessels were purchased, and though to a seaman they scarcely looked suitable for work round the British Coasts with untrained or partially trained crews, they did a great deal of good work and were well handled, often in bad weather. At first a great many yachts were taken up, but the hard work they had to do was almost too much for them and a good many had to be released later. Vessels of several kinds were also constructed for special purposes. Shallow draft paddlers for mine-sweeping, deep draft screw sloops for convoy and similar work, very fast and small coastal motor-boats for scouting and other purposes in fine weather, and so on.

The arming and equipping of these vessels was naturally a large problem. At first there were no guns available, and by the end of 1915 only about half the Auxiliary Patrol were armed. Even then the guns were small, being mainly 3-pdr. and 6-pdr. By degrees the armament was improved, the trawlers and larger vessels getting the first of the larger weapons and turning over their old armament to the drifters, etc. Nets were ordered by 500 miles at a time. Mines, depth charges, hydrophones and other apparatus had to be manufactured in large quantities and the vessels fitted to receive them. In fact, up to the very end of the campaign, there were always a number of vessels being fitted to receive some apparatus of a new type or having their fittings altered to admit of the use of some improvement. As far as possible the work was carried out at the same time as ordinary repairs to hull or machinery due to wear and tear, to damages caused in action, or to ordinary maritime accidents. But all this required that every one should work at high pressure and under good organisation. The majority of the vessels of the fishing fleet were by no means new, and it speaks well for their *personnel*, for the staff at the bases, and for the numerous private firms engaged in the work, that so large a proportion were constantly able to keep the sea in all weathers.

Research.

A further important point was the encouragement of new methods of seeking for and locating submarines, and of new scientific apparatus of any sort for dealing with them. To this end a Board of Invention and Research was early established by the Admiralty, composed of prominent scientists and engineers. To this Board all new inventions, claims or suggestions were referred, and an

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examination of their files would show as many quaint ideas as children's replies to examination questions. This plan was modified later by forming Committees at some of the large centres of industry, each of which were set special problems.

Experimental stations in existence before the war were continued and others added for the purpose of trying any promising idea, and a great deal of work was done in developing new apparatus or improving those in use.

Anti-submarine Division.

The supervision of this work, as well as the distribution of vessels, stores, and apparatus, and the general plans for dealing with the submarine menace came under the Admiralty, a special Committee, which later developed into a Division of the War Staff—the Anti-Submarine Division—having been formed to deal with it.

Booms.

Booms consisted of wire hawsers on the surface and nets below, and were of many different patterns. The nets in some cases were of heavy, in others of light wire, the latter being designed to be pulled off and act as indicator nets. The wire hawsers were supported by floats or buoys, and in many cases trawlers were moored at intervals to keep the boom in position, and act as a look-out and protection. Where required a section of net in each boom was used as a gate, to be lowered to the bottom, or swung open for the passage of our own ships. The area near a boom was mined, and both boom and minefield were protected by guns.

Mine-fields.

Minefields varied considerably, both in size and purpose. Some were designed for use against surface craft, others against submarines submerged. In some cases both were combined. At the beginning of the war we were very short of mines, and numbers had to be used which would not otherwise have been employed. Later they were used in great numbers. A minefield had a very disturbing effect on enemy submarines, and they would not willingly enter it if they knew where it was. In consequence, the laying of mines was always conducted with secrecy. Vessels were forbidden to cross areas where mines were laid, but as they were also prohibited from using many other areas this gave little information to the enemy. They were laid by vessels of all sizes, from the large minelayer to submarines and small craft. The practice of laying mines in the open sea was adopted by the enemy from the start, but such mines are dangerous to neutrals, and though we were obliged later to follow the enemy's procedure to some extent it was only after declaring the area dangerous. If our own mines broke adrift they became harmless automatically, but the enemy's mines remained active.

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At various places round the coast stations were established with hydrophones and other apparatus for detecting the presence of submarines, and by keeping a strict watch day and night, notice was frequently given of the enemy's approach. Such stations formed, in some cases, an addition to the boom defence, while in other places, such as off headlands or across bays, they proved of advantage. Shore hydrophones.

Several coastal aerodromes were built at which were stationed a force of aeroplanes and seaplanes, or airships. Owing to their speed the heavier than air type had a better chance of sighting a submarine on the surface, and of delivering an attack, than the lighter-than-air vessels; but, as a guard to a convoy, the latter was more effective, as she could keep with the convoy, or remain over the position where a submarine had been sighted. As a consequence the planes usually patrolled certain areas, while the airships helped to escort the convoys. The effect of neither can be judged solely by the number of attacks they made or of the submarines sighted, for the enemy had a wholesome fear of them, and when he knew that they were about was careful not to show himself. We could with advantage have used a much larger number of these craft, but were unable to obtain them. The type of aircraft most useful for Naval purposes differs considerably from that required by the Army, and as time goes on it is certain they will become more differentiated. It is particularly to be desired that the heavier-than-air types shall be able to remain much longer in the air. Observation balloons were also towed by destroyers and other vessels, and were useful in many ways. Aircraft.

At times, when the route followed by enemy submarines became known, concentrations of vessels were arranged. Sometimes these took the form of making a "dense area," *i.e.*, a large number of vessels moving about sufficiently near to each other to ensure that if a submarine came to the surface she would be seen, and forced to submerge again. The main object of this plan was to exhaust her battery power, and so to force her to come to the surface and fight. This required a considerable number of vessels, which necessarily had to be withdrawn from their usual work, and as we were always short it was not often possible to arrange it except for short periods. Later, when the "Fish" hydrophone was available, flotillas of trawlers, fitted with this apparatus, were able to perform the same work and, by following the submarine when submerged, a smaller number of vessels could do more than a larger number under the original plan. Concentrations.

Under somewhat similar conditions several miles of nets were sometimes laid in the probable track of submarines. The nets being Nets.

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fitted with mines were as effective by night as by day, but bad weather would cause serious interference, and the number of vessels required to lay and watch them was considerable. In other cases nets were laid parallel to a traffic route, and on one side of it, so that an enemy attacking might get entangled or blown up. Shorter lengths were laid out independently by single vessels, or by a group in their own areas, and this had the advantage of not requiring vessels to be moved from one area to another. The nets were sometimes moored with their supporting buoys under water; sometimes allowed to drift with the buoys on the surface, and in either case they might be fitted with mines or indicators. The object of the latter was to show that a submarine had become entangled, when she would be attacked with depth charges. Glass balls were used extensively as floats. The main difficulty in laying nets was to avoid being seen to run them out, so that they were usually laid at night. Towards the end of the war arrangements were made to lay a considerable length of net at high speed, the object being to run it across the course of a submarine located by hydrophone.

Q ships.

Q ships have already been referred to. There were a good number of these vessels at different times, and they were at the maximum utility during the two years of the second phase. When "ruthless" warfare commenced, and attacks other than by torpedo became rare, their opportunities became less. Many of the actions they fought have been published, and it would be hard to beat such tales of discipline and endurance.

Submarines on patrol.

Patrols of submarines were one of the most effective measures for dealing with the enemy at a distance from the coast and caused him some concern. At first sight it may be thought the chance of seeing an enemy in the open sea was exceedingly small, but a submarine has to make her passages on the surface on account of her slow underwater speed. Hence, if her approximate track is known, one of our submarines remaining submerged has a good chance of sighting her, and in favourable circumstances has an opportunity of getting a shot at her with a torpedo. Quite a number of the enemy have been destroyed in this way. The risk, however, is considerable, for any submarine sighted by our own ships or aircraft is at once attacked, and our submarines have to be as careful as the enemy to avoid them. When the enemy knew any of our submarines were stationed in a certain position they would, if possible, pass through that area at night, and therefore the patrol lines were frequently changed.

Depth charges.

The idea of using a charge of high explosive to explode under water was of old date, and various experiments were made years before the war. During the war they were continually improved,

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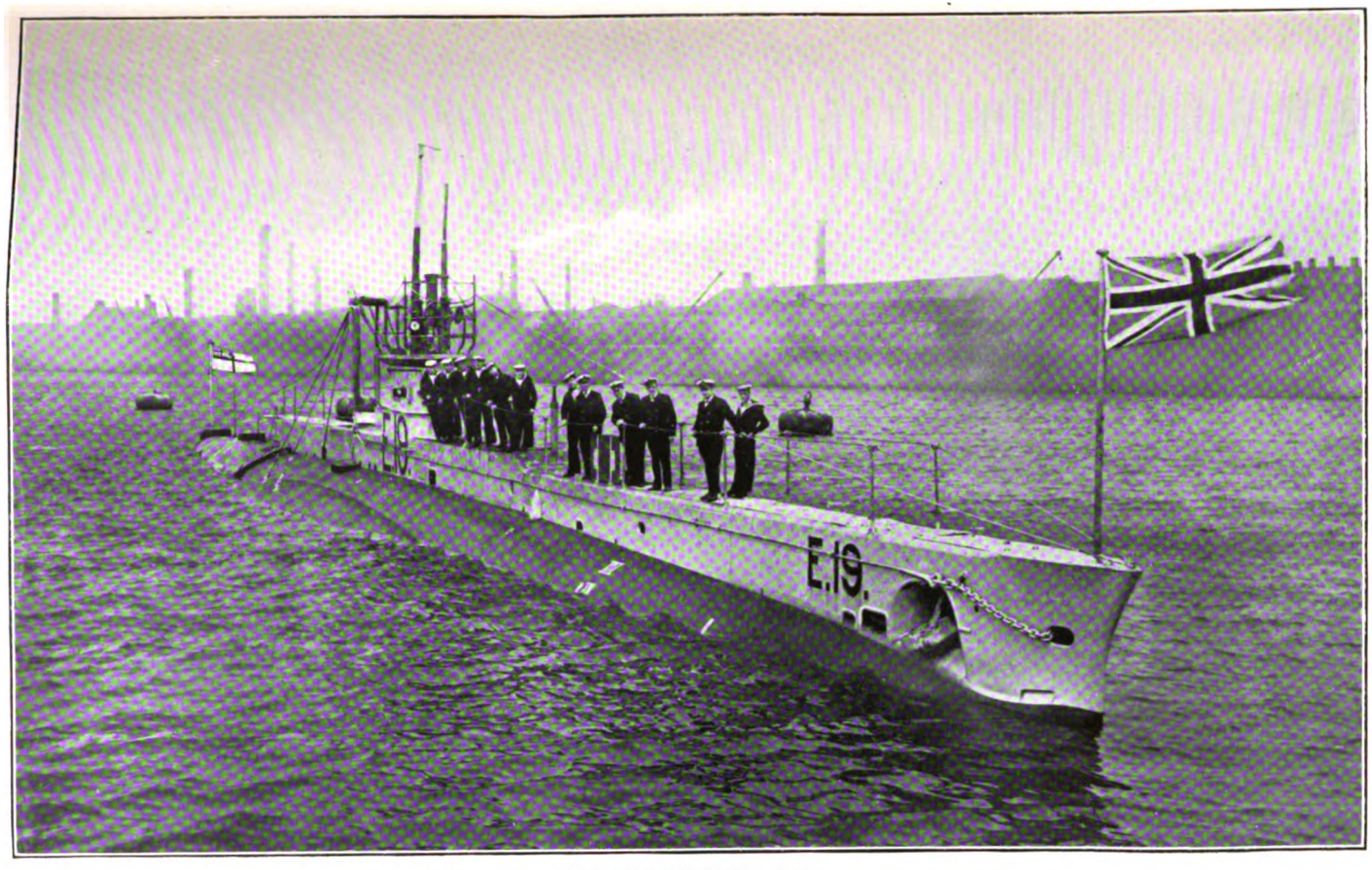

H.M. SUBMARINE E 19.

(600-800 tons, 1600-840 H.P., 15-10 knots, 1 3-in. gun, 5 18-in. T.T.)

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and were used by many types of vessels and frequently with success. The system of firing was by means of a hydrostatic valve. Charges were of several sizes, the largest containing 300 lb. of high explosive. Before the beginning of 1918 the average number used was from 100 to 300 a month, but during the last six months of the war the average was over 2000. At first single charges were used, then as vessels were fitted with improved apparatus for release, three or four were usually employed; and when several vessels were together quite a number would be used. Later on a depth charge thrower—a sort of gun—was introduced, and by using these in conjunction with the stern release, larger vessels such as destroyers were able to fire twenty or thirty in a very short time and cover a wide area. The effect of firing these heavy charges near a submarine may be to put out the lights or cause leaks at some distance, but to destroy one the explosions must take place within about 20 yards. The difficulty of estimating the position of a submarine some minutes after she has dived and actually destroying her is therefore considerable, and the percentage of successful attacks is consequently not high, though probably more submarines have been sunk by this means than by any other.

Hydrophones.

When first introduced hydrophones were, as mentioned before, non-directive, and consequently it was only by "trial and error" that the position of a submarine could even be guessed at. Later on, directional hydrophones were introduced, and when developed proved of value. The objection to them was that, unless the vessel using them was stationary, the water noises drowned those of the submarine. Subsequently, a towed hydrophone was invented which could be used immediately the vessels engines were stopped, and with this apparatus hunting flotillas of trawlers were equipped which did useful work. To each group of three of these a fast vessel was attached with a large supply of depth charges to attack a submarine located by cross bearings from the trawlers. Various other types of hydrophone were coming into use when the campaign closed. With hydrophones everything depends on the listener, and it was therefore necessary to establish schools. A considerable number passed through these establishments.*

Other measures.

The above are the principal types of apparatus in use, but there were numerous other devices such as howitzers to fire a heavy charge and burst under water, bombs and grenades to throw or fire, and flares for lighting up the surface at night; while, as useful additions, especially to the equipment of merchant ships, were smoke boxes and

* The technical reader can obtain details of the various apparatus used from the Service handbooks.

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other arrangements for making smoke screens, "Otters" for cutting mine moorings, camouflage painting for making it difficult for the submarine to judge the course of the ship she was attacking, and zig-zagging or steering an erratic course.

Mediterranean.

Similar arrangements to those round the British Coasts were also carried out in the Mediterranean, where conditions were peculiarly favourable to submarine activity. The narrow areas through which traffic had to pass, the numerous islands, the deep water, the clear atmosphere, and the fact that several nations were engaged, were all handicaps in the anti-submarine campaign which, in the end, were successfully surmounted.

General conclusions.

So much has been published in the papers describing attacks on submarines by one or other of these methods that nothing new could be added. Such actions were red letter days in the otherwise dreary round of watching and waiting, which continued throughout the war with occasional alarms, true or false, the protecting of merchant ships or saving their crews, sweeping up mines and endeavouring to get to close quarters with the foe. Through all this and supporting it was the feeling which every fisherman knows, the expectant hope that the next cast will hook the big fish.

From the above it will be seen that there was no lack of energy in combating the submarine menace, and that, notwithstanding the novelty of this form of warfare, we were able in the end to defeat the forces the enemy could bring against us. It is, perhaps, too much to say, that such methods as the Germans used will never be employed again, but it need not be feared that any civilised nation would adopt them. If any other should attempt to do so our accumulated experience gained during the war will enable us to meet them on terms which would probably compel their abandonment.

L. H. HORDERN.

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CHAPTER VII.

The Convoy System in 1917–18.

Convoy and Transport during the War.

The Mercantile Marine in the war.

In considering the danger to the alliance had the German submarine campaign not been checked, it is necessary to bear in mind the prodigious strain on the Mercantile Marine of this country involved by the execution of all the military and naval demands. At the outbreak of war world tonnage was in excess of world requirements, and for the first few weeks uncertainty about insurance and the threatened collapse of credit accentuated the difficulty of finding employment for shipping, but as these difficulties were removed, and the Government absorbed steamers for war purposes, the balance began to go down on the other side, and by the beginning of 1915 the demand for shipping exceeded the supply. This was shown by the rapidly increasing rise in freights, which led to much public talk of profiteering. With the extension of the war to Africa, Italy, Mesopotamia, the Dardanelles, Egypt and Salonika, and the rapid growth of the armies in the field, the proportion of British shipping used for purely war purposes and for supplementing the supplies of all our Allies, eventually became much larger than that employed in carrying on the essential work of our civilian population. Any vessel lost when on Naval, Military or Allied work had to be replaced by a ship taken from this residue, which was in no sense a reserve, because to feed this country and supply the raw material for munitions of war and for our few essential industries which were not temporarily scrapped, every vessel that we could scrape together was urgently needed. To meet the situation, ships were withdrawn from all the foreign trades, which had been built up by many years of work and anxiety against world competition. The trade between North and South America was stopped, and the vessels brought home to carry cargoes from the United States to England. The China coasting trade was broken up and the vessels transferred to the Persian Gulf, thereby setting free some larger steamers for Atlantic work. India, Australia, New Zealand, and the Far East were rationed in their supply of tonnage to the minimum of their own products without which this country could not carry on the war, and all the vessels obtained by this process were concentrated on the shortest routes, which practically meant the United States and Canada. By confining

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ourselves in this way to the nearest market we got the most use out of the ships, but in spite of these steps and the drastic curtailment of unessential imports, the situation at the beginning of 1917 was one to give the Ministry of Shipping the most acute anxiety.

The critical period.

The success which attended the German efforts in the month of April made it manifest that unless something could be done to diminish materially and quickly the rate at which ships were being sunk, the end of the war could be fixed with arithmetical precision at no very distant date. A calculation made at the time showed that in the last fortnight of that month the rate of loss in large ocean-going vessels was such, that out of every 100 steamers which left these islands twenty-five failed to return. The gravity of such a situation could be properly appreciated only by those who knew how many such vessels left and arrived in this country daily.

Patrolled areas.

It was apparent that the plan of "approach areas," which was then in use, was a failure. Each area to be patrolled necessarily covered a vast expanse—some 10,000 square miles—and no amount of patrol craft which it was feasible to spare for the purpose could suffice to prevent attack by submarine over such a large stretch of sea—indeed, it would appear that the mere presence of a patrolling craft was an indication to the enemy of the traffic routes, and no doubt enemy submarines, who were hunting for prey, were quite alive to this fact, and knew that, if they remained somewhere in the vicinity, sooner or later merchant steamers would be sighted. The patrol craft did invaluable service in the rescue of crews, but even so it was not an uncommon occurrence for the men to have been in their boats one, two, or more days before they met assistance.

A further precaution in the case of ships with specially valuable cargoes was to route them to a rendezvous, where they were to be met by an escort vessel and taken into port. In practice, however, many were not met, either owing to bad weather or the lack of escort craft, and in this case the masters were puzzled, and resorted to the use of wireless, in the Mercantile code—they sometimes even waited for further instructions. The code was undoubtedly compromised, and therefore any enemy submarine was able to take the message, which may account for the number of cases reported by masters of meeting an enemy submarine at the rendezvous instead of the expected escort.

Controlling outward sailings.

Another defensive course largely adopted was the imposition of an embargo on outward sailings from any port when a submarine was known or suspected to be in the vicinity of the port in question. This became of such frequent occurrence that it was calculated in

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the spring of 1917 as equivalent to 40 per cent. of a complete blockade of our outward trade.

New methods required.

These methods of defence proved very unsatisfactory. The approach route to the South-west of Ireland was becoming the graveyard of British shipping, which was being sunk with regularity about 200 miles from the land, and it was apparent that something new must be tried. The success of the controlled sailings of the cross-Channel coal trade to France, by which the steamers were sailed in groups as the submarine situation permitted, decided the Admiralty to institute a regular system of convoys for the foreign trade. The objections to this course hitherto had been founded on the delay to shipping involved by holding up steamers to collect a convoy and by making the convoy proceed at the speed of the slowest ships, on the larger size of the target, on the difficulties of station-keeping in the case of untrained merchant seamen, and on the vast number of ships requiring to be dealt with.

The problem of convoy.

The delays, already consequent on frequent embargoes and very devious routes, were a sufficient answer to the first objection. The possibilities of the large target being a source of embarrassment, if not of actual danger, to the submarine was urged in reply to the second point. It was contended that a convoy of merchant ships, keeping reasonably good stations, and zig-zagging under command, would be a formidable object to attack, viewed from a periscope ahead, and that efficient protection by destroyer escort would probably limit the attack to a "browning" shot, which, if successful, would only destroy one ship out of the convoy; whereas, the same submarine, if she encountered only one-fifth of the number of ships in the convoy, sailing singly, would probably account for at least two or three of them. Furthermore, there was the opportunity for instant counter-attack by the destroyer escort. With regard to station keeping, which was essential to the success of a convoy system, it was held that the shipmasters would, under instruction, soon acquire the art sufficiently for practical purposes, and final inquiry showed that the number of ships which would be involved was nothing approaching so many as the Admiralty had anticipated.

Support of this idea was given by the Ministry of Shipping, which realised that something must be done, and could view with comparative equanimity the possible loss of one ship per convoy as an alternative to the destruction of forty or fifty steamers per week, which had been the toll taken by the submarines in April.

Experimental convoy.

An experimental convoy was sailed from Gibraltar, consisting of seventeen steamers, and another from North America with twelve vessels. They were a complete success; station-keeping was quite

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good, and the masters who were interviewed on arrival home stated that they had enjoyed more sleep than they had had for months. Being relieved of the unwonted responsibility of coping with an enemy, they accepted, without demur, the increased difficulties of their proper business of navigation.

Complete scheme of convoy.

Simultaneously with the organisation and despatch of these convoys a small Committee, at which the Ministry of Shipping was represented, was set up by the Admiralty to draw up a scheme for a complete system of convoys. It fell to the Ministry of Shipping to say on how many routes convoys would be required; how frequently they would require to run; of how many ships, and what type of ship each separate convoy was likely to consist; to point out that, in spite of a possible danger of information leaking out, neutrals trading with and for the Allies would have to be included, otherwise we should lose their services, and to suggest methods by which might be minimised the delays incidental to any system of sailing in groups. On this ground plan was built up the numbers of cruisers required for ocean escort work as protection against surface attack, and the numbers of destroyers, etc., required for escort through the immediate submarine danger zone. There were destroyer bases to be selected appropriate to the routes by which inward bound convoys would approach their dispersal points, officers to be appointed at the focal points abroad to assemble the ships, and harbours to be selected and defended on this side for the collection and despatch of outward bound convoys. It was laid down that the officer commanding the cruiser escort should, before the convoy sailed, instruct the masters by lecture about the formation of the convoy, station-keeping, the reception and transmission of signals, and the action to be taken in the general emergencies which might arise. Signal ratings were to be provided to all the ships, and an officer, R.N. or R.N.R., was to be appointed as Commodore on board of one of the faster ships of the convoy. Certain gear was required for the ships, such as buoys for towing in fog, stern lights dimmed and limited in radius, efficient voice pipes to the engine room, an extra set of flags, and good morsing apparatus. Rules were laid down for signals in certain eventualities, and orders and recommendations were made as to action to be taken in the event of attack by the enemy, but, generally speaking, care was taken to leave the officer in charge of the convoy ample discretion to do what was best in circumstances the nature of which it was impossible always to forecast.

Scheme in practice.

There were difficulties about collecting the forces necessary for the execution of this scheme, so that some little time elapsed before

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the system could be got running as a whole, but by the end of August all ships homeward bound, except those with a speed above 12 knots, were arriving in convoy, and in the beginning of September arrangements were made by which convoys of faster vessels were formed to include such ships. The results were most encouraging. Fourteen convoys, comprising 242 steamers, were brought in without the loss of a vessel, and it was felt that, although the submarine danger was far from being eliminated, a means had been found by which it was probable that its success could be frustrated. By the middle of August it became noticeable that the enemy, failing to find the homeward bound traffic as easily as before, were now devoting their attention to the outward bound ships, a large proportion of which were in ballast. At the end of April, the proportion sunk had been 7 per cent. outward bound as compared with 18 per .cent. homeward bound. Now, while the number of inward bound ships lost was rapidly decreasing, the sinkings of outward bound tonnage were becoming more numerous. Action was accordingly taken to run outward bound convoys. This greatly added to the work of the escort forces, the number of which could not be increased, and necessitated very careful dovetailing, so that an escort force, which had taken a convoy out through the danger zone, should be available to bring a homeward bound convoy back. Any flexibility which was formerly possessed in the matter of destroyer escorts was reduced almost to vanishing point, and the programme drawn up had to be adhered to rigidly; the slight margin that remained was required to cope with exigencies such as were involved by the late arrival of a convoy owing to bad weather. The destroyer crews were very hard worked. Several of the officers broke down under the constant strain, and the destroyers themselves suffered severely as the winter came on.

Outward bound convoy.

By the end of October, 1917, ninety-nine homeward convoys had been brought in, comprising 1502 steamers, of an estimated total deadweight capacity of 10,656,300 tons, and twenty-four steamers which had started in these convoys had been lost. Of these twenty-four no less than fourteen had been sunk after being separated from their convoys, either by bad weather, or the disobedience of the masters, and only ten had been sunk when actually in contact with their convoys. With experience, and as the masters more generally realised that their safety depended on their continuance with their convoy, the number of ships lost by straggling or separation became very much reduced. At the same date the figures for convoys escorted outwards through the United Kingdom danger zone were seventy-seven convoys, 1052 ships, 6,999,500 tons

Statistics.

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total deadweight capacity, and the percentage of loss ·57, or just over one-half per cent.

Ships were still being sunk, but only at half the rate at which they were disappearing in April, and the curve of loss was steadily declining. The position in which ships were attacked was different, for the enemy abandoned his tactics of trying to meet the convoys at sea, in which he was very unsuccessful, and concentrated his attention on the coast. This meant that tonnage sunk was no longer for the most part large steamers homeward bound with very vital cargoes, but smaller vessels in the coasting trade, and when a large steamer was involved, she was generally in ballast bound round the coast to load at Cardiff or elsewhere, or perhaps on her way to an assembly port for outward convoy. The average size of ships sunk April to July, 1917, inclusive was 5084 tons gross register. In the four months September to December, 1917, this average size had fallen to 4342 tons, and, with variations, the decline in size was continuous, till in September, 1918, the average size of ship torpedoed was 2827 tons.

Effect of convoy—reduced losses.

The statistics for British ships only at the end of December, 1917, showed that, whereas during the five months April to August the losses over 50 miles from the land were 175, an average of thirty-five per month, during the period from September to December, the ships sunk at this distance from the land for the whole four months only reached a total of six, of which four were sunk in September. In other words, before convoys were in full operation, nearly 60 per cent. of the ships sunk were in the open sea, but when the effect of convoys was felt, this proportion of the vessels lost became insignificant. The result of this from the point of view of life-saving was enormous; it meant that a crew, even when their ship was torpedoed, and they had to take to their boats, were rarely more than 10 or 20 miles from the land, and probably had a coastal patrol boat to their assistance in less than half an hour. This was a very different ordeal from that which had to be faced in the first six months of 1917, when the ships were sunk 200 and 300 miles from the land, and when the majority of those who managed to get into their boats died from exposure before they reached land or were picked up. Moreover, it practically eliminated the danger of the master or chief engineer being taken prisoner by the submarine. This was a device which the Germans had adopted with a view of impairing moral, and it is a credit to the Mercantile Marine that they stood for so long, with very little chance of retaliation, the risks to which they were exposed. How long their courage would have stood the test had the convoy system not altered conditions at sea is a debatable question.

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An extra call was made on the seamanship of the masters and officers, but they were relieved from the anxiety of interpreting Admiralty orders, and the responsibility of deciding how they should be executed in widely different circumstances and with very vague knowledge of the potentialities of a submarine. For example, under the convoy system war warnings and individual distress signals were no longer a matter for the shipmaster, but demanded action on the part of the Commodore. What seemed a very well grounded fear that in the winter light ships outward bound would not be able to be kept together as a convoy proved unwarranted. Bunkered for the round, and when necessary extra ballasted, the ships were kept in station by their masters and the convoys proceeded as regularly as in the summer months. Increasing skill.

The possibility of salving a torpedoed ship was also vastly increased by this change of tactics which had been forced on the enemy, and in the case of a convoy casualty there was also help in the shape of two or more tugs ready at hand. Part of the Admiralty's convoy organisation was the despatch of two or three of these vessels to the rendezvous with instructions to cruise in the neighbourhood of the incoming convoy. At first the niceties of navigation made it difficult for them to pick up the rendezvous, but as their compasses were improved, and the rendezvous was gradually brought further east, these troubles were overcome, and on many occasions their presence in the vicinity proved of great service after a successful attack. Another notable change produced by the convoy system was the practical disappearance of "sunk by gunfire," which had accounted for a large percentage of the vessels destroyed prior to August–September, 1917. Salving shipping. Use of tugs.

The extension of the system to the Mediterranean was a more complicated task owing to the cross-country nature of most of the voyages made in that sea, and the number of nationalities contributing to its protection. Elaborate statistics were evolved of the weight of tonnage on the different routes, and then a scheme was produced in the nature of a railway system, with main lines and junctions for branch lines. It was difficult to get adequate or efficient escort craft owing to the competing claims in those waters of other methods of dealing with the submarine, and it was not till early in 1918, that the system was fairly established, and it was the beginning of the summer before it could be felt that matters were distinctly improving as regards losses. But in these waters losses by submarine had not been the only drawback. The delays caused by the patrol and embargo system prior to the introduction of convoys had been extremely serious. There being no recognised day for leaving a port, Convoy in the Mediterranean.

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such as there was when convoys were set going, steamers waited often for a week or longer for a patrol escort. The progress along the North African coast, steaming by night and taking refuge in the nearest adjacent port by day, accounted for a prodigious waste of time. It was calculated in May, 1918, that the introduction of the convoy system had so far reduced delay in the Mediterranean as to increase the efficiency of the vessels in those waters 25 to 30 per cent. The losses by submarine for the five months from August to December, 1917, averaged twenty-six per month ; for the following five months, January to May, the average was twenty-five, and for June to October, 1918, the monthly average was thirteen.

Suez Canal route resumed.

Apart from this, however, the introduction of the convoy system to the Mediterranean enabled the use of the Suez Canal route to be resumed for the Eastern trade, and thereby effected a saving of 40 per cent. of the steamers required to bring products home from the East, which were essential to the prosecution of the war. The vessels economised in this manner were available for use on the North Atlantic, and though the early losses in these through convoys, before experience had shown how they should best be organised, caused some tremor in the minds of those responsible for the initiation of the change, the subsequent success of the venture, and the great saving of time, particularly with the Indian boats, justified the tenacity with which the policy was maintained.

Military advantages.

Another noticeable result must have been of great benefit to the officers commanding the Armies in France, for the existence of a regular convoy system in the Mediterranean, and its application to the movement of troops, led to a remarkable improvement on former practice. By utilising the through convoys just mentioned as far as Sardinia for the artillery, M.T. and horse ships, and by sailing all the troopers simultaneously in one convoy, a division complete with all its *matériel*, could now be moved from one end of the Mediterranean to the other in approximately a fourth of the time which was taken when the ships sailed under escort one or two at a time.

Immense numbers of ships were dealt with in the Mediterranean. To take two routes only :—From February 10, 1918, to November 5, 1918, seventy convoys, comprising 1311 steamers of a gross register tonnage of 5,061,815, sailed from Gibraltar to the Gulf of Lyons and Genoa. From January 1, 1918, to November 9, 1918, seventy-nine convoys sailed from Gibraltar to Bizerta with 1014 ships of 3,645,608 tons gross register. Similar numbers were sailed on the return journeys.

Scandinavian convoy.

Of all convoy systems perhaps most public attention was attracted to that run to Scandinavian ports owing to the successful surface

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attacks made against it on two occasions, when a gallant but unsuccessful defence was put up by forces which were overwhelmed by the enemies' superior strength. The lessons gained by these attacks were, however, thoroughly learnt, and alterations were made which resulted in a very remarkable success. From February, 1918, to the date of the Armistice, 4207 vessels were convoyed between the United Kingdom and Scandinavia, the total number lost being eighteen, or ·43 per cent., and of these about half were sunk on their passage down the East Coast and not between the United Kingdom and Scandinavia. In considering this result it must be remembered that the bulk of the vessels were small, slow ships, and very largely neutrals, and the masters and crews of these neutral steamers have expressed their deep gratitude for the measures taken to protect them. Apart from an occasional straggler dropping out of the convoy, they were never seriously interfered with.

United States Army transport.

When the call came to move the American Army to Europe, the convoy organisation was complete, and adapted itself to troop carrying, with little more than the despatch of a telegram. Ships were altered from the carriage of cargo to the transport of men ; in some cases the type of ship was varied, but the escort forces, with a little strengthening, carried on just as they had done before. The only change apparent to the destroyers was that they had to meet a troop convoy somewhat further west than usual, and escort it nearer to its port of discharge. Had the defence of the system against submarine attack not been amply demonstrated by the success of the mercantile convoys, it is questionable whether the United States would have ventured to send their men across so rapidly, and in such large bodies, and it is undoubtedly the case that to get a decision on the best course to pursue, and then to build up the system, would have taken months. From the middle of April till the end of October, 1918, during which time the pressure was maintained, apart from the American convoys which went direct to France, troop convoys from North America came into this country every four days. The largest number of men carried in any one convoy was 31,693, and the loss of life in this whole period due to enemy action was fifty-six soldiers in the Moldavia, though collision and subsequent stranding on the Coast of Islay led to the loss of over 500 men on board the Otranto.

Working the convoy system.

When homeward convoys started from an assembly port adjacent to the ports where the ships loaded, they were generally made up for the West Coast and alternately for the East Coast, including the Channel and Bay ports. To minimise the detention which would arise when a vessel bound for Liverpool just missed a West Coast convoy, arrangements were made by which most ships with

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homogeneous cargoes sailed in the first convoy available, their ports of destination being decided when it was known whether they were coming East or West. In 1918, when all the cargoes were for Government account, this principle was carried further and became applicable to the liners. Other steps taken to reduce the delays inevitable in any method of sailing ships by groups were the introduction of convoys of different speeds, as experience showed what the proportionate ocean-going speeds were of the ships in the various trades; from North America, for instance, there were four different classes of convoy, the range of speed from the slowest to the fastest being 5 knots.

Fast and slow ships. Diversion of shipping.

Ships which would be a drag on the slowest convoy were, as far as possible, drafted to parts of the world where no submarine danger existed, and experienced shipping men were sent to the convoy assembly ports abroad to assist the purely naval port convoy officers with their technical knowledge and by a careful attention to detail to supply, as far as possible, a substitute for the monetary consideration, which, in normal times, acts as a commercial barometer to call attention to defects. For example, when the missing of a particular convoy entailed serious detention, it was left to the discretion of these gentlemen to shut out 100 tons or so of cargo to get the ship away; or they might send a cable to ascertain if the destination of a ship would be changed so that she might catch an earlier convoy. In American ports the result of their work was to reduce the time spent on the other side by an average of about 35 per cent. They also devoted a great deal of care to the question of bunker coal, as it was found that the masters had a strong tendency to overestimate the quantities they would burn when running, as some of them of course had to do, at a knot or two below their normal speed.

There was a certain amount of congestion at the ports, particularly at Liverpool, which was no doubt accentuated by the fact that convoys brought in a considerable number of ships on the same tide, but it is doubtful if there was more than one occasion when the number of vessels was in excess of the berthing accommodation. Such congestion as there was arose mainly in the sheds, and was due to the presence of large stocks, very much larger than those carried in normal times, for which no adequate store provision had been made inland, and which accumulated in the docks. The restriction of steamers to one port of discharge, in order to reduce the coastal traffic, was no doubt also responsible for difficulties in the sheds, as well as for some extra work to the railways.

To remedy this as far as possible, if congestion in Liverpool seemed to be impending, vessels were diverted to other West Coast

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ports when escorts and the submarine situation were favourable. It was usually a comparatively easy matter to divert into the Bristol Channel ships coming in a convoy from the South; or to Glasgow ships in a convoy coming round the north of Ireland; but in the case of the large fast vessels there was always the difficulty of getting out again when they were scattered in different ports. Other diversions were frequently asked for at the instance of the Ministry of Food. It is a tribute to the convoy system that the losses of cargo for this Ministry had become so infrequent that many of the requests for diversions seemed to be framed with entire disregard to any submarine menace whatever. In this connection it is remarkable how fortunate some of the services were. During the existence of the convoy system 895,651 tons of oats were shipped by the War Office on behalf of the Army in France and England, and not one single ton was lost.

Homeward and outward convoys.

The number of homeward convoys dealt with on the Atlantic system was 607, and the number of ships was 9354, of a gross register tonnage of 50,057,129 and a total deadweight capacity of 68,314,500 tons. Of these, 104 ships of 515,816 gross register tonnage and 702,200 tons deadweight capacity were lost, including thirty-one vessels sunk when not in contact with their convoys, and twelve sunk by collision or stranding. Eliminating these the total sunk by enemy action when in convoy formation was sixty-one ships, or a percentage of two-thirds of 1 per cent. Taking in all the ships sunk by whatever cause, the loss was 1·11 per cent. in number and 1·03 per cent. in gross tonnage.

Outwards the figures were 7339 ships in 527 convoys, with a gross register tonnage of 37,156,290 and a deadweight capacity of 52,044,900 tons. Ships sunk from all causes were fifty, with gross register tonnage of 323,808, and deadweight capacity 422,900 tons, a percentage of ·68 in number and ·87 in gross register tonnage. Deducting four ships sunk by collision, and five sunk when separated from their convoys, the percentage of loss was ·56.

In summer calms and in winter gales, in clear weather and in fog, in bright moonlight and on pitch-dark nights, these convoys were taken in and out through an area infested with enemy submarines. That fleets of merchant ships, often as many as forty in a convoy, should be kept together in good formation, steaming without lights in all weathers, is in itself marvellous; that this should have been done over 1100 times with a loss from all causes of less than 1 per cent. of the ships convoyed is something of which all concerned may indeed be proud.

Apart from the protection actually afforded by the system of

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convoys, their existence gave the Admiralty for the first time a real control of shipping. In the patrol era vessels were held up for hours, or it might be for days, when local danger was suspected, but barring the closure of the Suez Canal route to the United Kingdom, no attempt was made to interfere with peace-time practice, or to impress upon the shipping community the fact that the less travelling about in the danger zone that was done the better. Thus, in the first six months of 1917, large steamers still discharged at two ports, such as London and Middlesbrough, and loaded at three ports, such as Glasgow, Manchester and London. The Royal Mail boats continued to load in Liverpool, and put into La Pallice and Lisbon for cargo and passengers, making similar calls on the voyage home, and ships were sent freely from French channel ports to Cardiff for bunkers. With the close touch which, as a consequence of convoys, grew up between the Admiralty and the Ministry of Shipping, procedure of this kind was obviated. Coasting voyages were restricted to the smallest possible limits, bunkering facilities were increased in the French and British Channel ports, so that many ships could avoid the dangerous passage round the Land's End, and it became the practice to consider the submarine situation and consult the Admiralty when any question of shifting ports necessarily arose.

In any future war preference will require to be granted to this or some other system which gives control, or, in other words, fixes responsibility on individuals, as opposed to a method of procedure which, while giving orders, merely expressed regret for their inefficiency.

Besides giving the Navy the control of shipping movements in the sense just indicated, the convoy system imposed an important degree of control on the tactics of the enemy.

Effect of convoy on U-boat tactics.

During the course of the unrestricted submarine campaign a good deal has been heard from the lips of eminent persons about the destruction of the enemy's submarines. The effect, no doubt calculated, of these utterances falling on the ears of an uninstructed and eagerly imaginative public was to create an impression of wholesale destruction. The usual occurrence of a bad week to discount some of the encouraging statements was apt to be forgotten in the general desire to believe the best, and as nearly every shipmaster who fired a gun at a periscope, or what he thought was a periscope, was full of the hope that he had sunk a foe, there is every reason to think that in the public mind the decrease in losses and the practical immunity of convoys were ascribed to the mortality in the enemy's ranks, and a consequent diminishing number of submarines. The exact contrary was, however, the case. The number of submarines at sea was

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continually growing, and whatever acceleration there was in the rate of their destruction was mainly due to the fact that ships sailed in convoys. April, 1917, was the German's "banner" time. He was said to have made a great effort in the two perilous weeks of that month. He must subsequently have made greater efforts to repeat his success, for there is reason to believe that the number of submarines which he kept at sea in subsequent months was frequently 30 per cent. and in some months nearly 50 per cent. more.

Defeating the submarine.

Whenever a submarine was spotted in the Irish Sea or round the coast by a hunting destroyer, or any other mobile agent of destruction, it was immensely a matter of chance. Anyone who has ever been out of sight of land had only to look at the vessel which for a time was moored off the Houses of Parliament, and to compare her with what he remembered of the open sea, to realise how slight was the chance of detection. Submerge her (and in daylight they lived submerged), and what is left? Two or three feet of periscope, not much thicker than a broom handle, and that only above water for seconds at a time. What chance was there then of getting them when they plied their trade in the wide Atlantic, 200 miles from the land? In those waters the convoys, though they were covering an expanse of three or four square miles, and pouring smoke from many funnels, were not often sighted by the submarine, and, if sighted, it was rarely on a bearing from which an attack could be developed. True, there were other dangers than hunting squadrons—there were minefields. But minefields would not have been very practicable in 15 degrees West. It was the convoy that brought them into the land; it was the convoy that located them, for the convoy was their ground bait, and it was their experience of the danger of attacking convoys that induced them to concentrate on the coastal traffic, and got them into trouble. The extensive minefields in the North Sea, from which so much was expected to follow in the month of August, worried them, no doubt. Some are believed to have perished there, but this did not stop them. We read with pride of how our own fellows went through the mines in the much more difficult water of the Dardanelles, and there is no reason to suppose the Germans were not equally brave and skilful. It cannot be a pleasant ordeal to come through a minefield, and it must be a weight on one's spirits to know that the return journey will entail the same danger. Local and unexpected minefields off the English coast, destroyers, chasers, P-boats, submarines, sloops, seaplanes, airships, and motor-boats always on the hunt, may well have scared the most frightful Hun. These were things he had to endure if he dared not go back with an empty basket, for off the coast was the only fruitful fishing-ground.

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In the old days he could rest at leisure on the surface, far from the gaze of any airship, and with no risk to himself sink a ship when opportunity offered, but all that was spoilt for him by the convoy system.

Thus the convoys of 1917-18, though considered a defensive scheme, possessed many elements of bringing the enemy to action. Whenever a convoy was attacked, retaliation was instant on the part of the attending destroyers, and the presence of convoys brought about more actions between the contending forces than all the other causes which operated during the war. To indicate what the submarines had to face, it may be mentioned that, whereas the original equipment of an escorting craft was four depth charges, this was increased to such an extent that some classes of vessel were ultimately provided with thirty, and on occasion as many as forty depth charges have been dropped by protecting escorts over one submarine. With more evenly matched forces, or perhaps with a more enterprising enemy, a fleet action would probably have been fought over the first American troop convoy, and the analogy with the old wars, when sea battles were so frequently fought with a convoy as the prize, would have been more vividly realised than perhaps was the case when the attack was confined to the use of a novel weapon.

As it was, we were able, in spite of the submarines, to carry food, raw materials, munitions, and men for ourselves and our Allies, and the great German plan to conquer the world by cutting Great Britain's sea communications was wrecked by the success of the convoy system.

N. A. LESLIE,
Ministry of Shipping, S.W.

February 25, 1919.

[The author of this article desires to state that it is written entirely from the shipping standpoint, making no attempt to deal with the Naval side, and that the Admiralty are not responsible for the views expressed.—EDITORS.]

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NOTE ON THE ALLIED MARITIME TRANSPORT COUNCIL.

THE war would not have been won if the Allied countries had not been supplied with adequate quantities of food for their people, of raw material for their manufactures, and of munitions for their armies. The allocation of shipping in relation to these necessary supplies was a determining factor in the conduct of the war. The mercantile marines of France and Italy were from the beginning inadequate for the service of those countries; and, for the great extent of the American military transport, America's tonnage, except in the case of tank tonnage, which brought oil fuel to the allied navies, was, up to the end of hostilities, insufficient for America's requirements. There existed a serious shortage of shipping for the requirements of the Allies, and for a long time the United Kingdom had to bear the whole of the burden. Great Britain cut down her national requirements by a drastic restriction of the supplies of her people, and she was the only country which had tonnage available for the use and supply of other countries.

In the early years of the war each Allied Government solved its own supply and transport problems. A fixed tonnage of British shipping was lent to France and Italy, and those countries, thus supplied, carried out their own national programmes. Enormous supplies were sent to Russia, and in order to relieve the Imperial Russian Government of heavy charges it bore, the Admiralty arranged that tonnage should be supplied for Russian supplies at Blue Book rates. It became increasingly evident, as the war went on, that the system required to be set upon a broader basis. It was not a question of shipping alone. No Allied country must be left with a dangerously narrow margin of some essential supply, *e.g.*, nitrates or munitions. The real question, then, was to decide how far allied food supplies should be allowed to absorb tonnage as compared with—and at the expense of—allied munition supplies, and not merely what supplies of food and munitions should be allotted to Great Britain as compared with France or Italy. Tonnage governed the whole problem, and the due allocation of tonnage to the needs of the Allied countries and the particular needs of each was a matter of vital importance.

To control and administer the vast business of shipping and supply, the Paris Conference, in December, 1917, decided to institute an Allied Maritime Transport Council, with the object (1) of making the most economical use of tonnage under control of all the Allies; (2) of allotting such tonnage according to the differing needs of the Allies; and (3) of adjusting the programmes of requirements of the several Allies in such a manner as to bring them within the possible carrying

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power of the shipping available. The Council accepted responsibility for the supply of coal to France and Italy, for Belgian relief, the Allied food programme, and the Allied munition programme, as well as the Neutral Pool Tonnage—neutral tonnage assisted in the work of transport.

In September, 1918, the United States entered into complete association with the Allied Maritime Transport Council. At the time when the Council was constituted, it was anticipated that the United States would be in a position to furnish tonnage. It was proposed that 1,000,000 men should be despatched by the United States and landed by December 31, 1918, but the increased number —over 2,000,000 were actually landed by November, requiring an extra 1,250,000 tons deadweight tonnage—created a new and unexpected situation which affected very considerably the work of the Allied Maritime Transport Council. British, French and Italian passenger vessels were employed throughout the year for the transport of American troops, and British cargo tonnage was provided in October and November for the work of American Army supply.

The following extract from a report on the work of the Allied Council is appropriately given here. It sets forth some of the difficulties of the problems, and pays a noble and well deserved tribute to the qualities of British seamen.

> The Allied supply and transport arrangements have been confronted with almost innumerable difficulties during the war. Apart from the destruction of ships by submarine, any change in the military fortunes or in military or naval strategy, the failure of a harvest, a political event such as the Russian Revolution, a severe winter frost in North America, an epidemic of influenza, and a host of less important events, have at once, and to a serious extent, affected the adjustment of supplies to tonnage. Amid these many difficulties the Allies have been happily free from any anxiety whatever as to the conduct of the officers and seamen of the Mercantile Marine. No calculation has ever had to include an allowance for the human factor. Even when vessels unarmed and without wireless were required to proceed unescorted and without convoy to waters infested with submarines, crews were always available and willing to sail. The enemy had attempted two objects in adopting the more ruthless form of submarine war—the first to increase the destruction of vessels, the second to break the moral of the officers and men of the Mercantile Marine. In the first, they achieved for a time a considerable, and a dangerous, success. In the second, they failed and failed absolutely.

The Allied Maritime Transport Council consisted of the following members: Lord Robert Cecil, K.C., and Sir Joseph Maclay, Bart., (Great Britain); M. Clémentel and M. Loucheur (France); Signor Villa (succeeding Signor Salvatore Orlando) and Signor Crespi (Italy); Hon. R. B. Stevens and Hon. G. Rublee (United States). The Executive consisted of M. Jean Monnet (France); Prof. Attolico, C.B. (Italy); Hon. G. Rublee (United States), and Mr. J. A. Salter, C.B. (Great Britain). J. L.

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CHAPTER VIII.

The British Navy.

Construction in War Time.

Removal of the censorship.

During the past five years—for the last peace edition of the *Naval Annual* was published in June, 1914—it has only been possible to indicate in very general terms the progress of British warship building, and the accession of material strength which the Fleet has received since hostilities began. The public, by occasional official announcements, became vaguely aware of the advent of new vessels which made the Fleet, relatively as well as absolutely, more powerful than it was at the declaration of war. In every class of vessel, losses, due to the ordinary marine hazards or the action of the enemy, have been more than made good. In a few instances, when it could be done without affording information to the enemy, the Admiralty permitted certain particulars of the design and equipment of the new vessels to appear in the Press. This was notably so when the monitors arrived in the Eastern Mediterranean to take part in the Gallipoli Expedition. In the War Edition of the *Naval Annual* for 1916, a short summary of such information as was then available was given as a preface to the Ship and Flotilla Tables in Part II, but it was necessary to suppress the plans which accompanied the Tables, and the brief statistics which it was possible to publish were issued with the knowledge and concurrence of the naval authorities. Now, however, that hostilities are at an end, it is no longer necessary to observe this reticence, or to conceal the unexampled extent to which the shipbuilding resources of the country have been utilised during the five years 1914-19. The work has not only included the output of vessels of war, many of them of entirely new design, but the execution of repairs made necessary by the extraordinary wear and tear of the struggle at sea.

Record construction.

When the work is explained in detail, it will be seen that it speaks most highly for the enterprise and efficiency of the private shipyards and engineering establishments, many of them engaged for the first time on warship work; for the organisation of the Royal Dockyards; and, above all, for the Constructive Department at the Admiralty. Under its Chief every call made was answered with the utmost zeal and alacrity. Designs were prepared inside record time over and over again. Processes of construction and equipment were speeded up in an unparalleled manner, and the

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result was an output of which the country has every reason to be proud.

Submarine complications.

It is not pertinent here to set forth in full detail the immense scope of the Admiralty operations. Although the naval authorities had the first claim on the shipbuilding resources of the country, the problems which confronted them were made most difficult by the strain which the submarine campaign, and the calls for military transportation, put upon mercantile shipping. To meet tonnage losses it became necessary to allocate many of the shipyards and workshops engaged in naval work for the production instead of merchant vessels, and in addition the steps taken to provide means for combating the submarine were retarded by shortage of material and shortage of labour.

Tonnage expansion.

Some interesting information in connection with construction and supply was given in the War Cabinet's Report (Cd. 9005) for 1917. It was therein shown that the displacement tonnage of the Royal Navy had increased by 75 per cent. over the total of 2,400,000 tons in 1914. The ships and vessels of all kinds employed in the Naval Service in September, 1914, had a tonnage of just over 4,000,000; it had increased to well over 6,000,000. Transports and auxiliaries of all kinds then numbered twenty-three; the number at the end of 1917 under Admiralty control was nearly 700. The Report continued:—

> From these brief particulars regarding the ships and their manning, an estimate can be formed of the expansions that have been made in the auxiliary services, such as guns, torpedoes, munitions, and stores of all kinds, anti-submarine apparatus, mines, etc., and some idea is gained of the demands that have been made upon the great army of workers on shore, the men in the Royal dockyards and arsenals, in the shipyards, the engine shops, and the factories, without whose help the Fleet could not be maintained as a fighting force.
>
> As regards warship and auxiliary ship construction, the output during the past twelve months has been between three and four times the average annual output for the few years preceding the war.
>
> The Admiralty now control all the dry docks in the country, and of these 235 of considerable size (excluding those allotted to the Royal Navy) can be devoted to merchant ship repairs. The remarkable figure of use of 90 per cent. of the maximum time has been achieved in the operation of these docks, and 250 merchant ships are being repaired each week, either in dry dock or afloat.

Lord Fisher's programmes.

Accustomed as the British people were in the past to very frank and full statements on the Navy Estimates, and at other times from the Admiralty officials, it was noticeable how seldom any similar announcements were made during the war. It seems appropriate, however, to place these on record. Speaking in the House of Commons on November 15, 1915, after he had resigned from the Cabinet, Mr. Churchill said:—

> I do not at all regret having insisted on Lord Fisher's return, in face of great opposition, to the Admiralty in November, 1914. No man has ever been able to put war purpose into the design of a ship like Lord Fisher. At the beginning of this war

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megalomania was the only form of sanity. Prince Louis and I had ordered large war programmes on the outbreak of war, and perhaps from some points of view they may have been considered sufficient at the moment, but Lord Fisher came along with a new wave of impulse and enthusiasm. He was able to produce vast schemes of ship construction of every kind, with new designs and improvements on the old designs. Hardly a day passed without his bringing new projects to me which I was delighted to encourage, and which, through the absence of Treasury control, I was happily able to finance, and if my right hon. friend the First Lord of the Admiralty to-day finds himself, as he does, week by week, up-borne upon an ever-swelling tide of deliveries of craft of all kinds, and of a kind best suited to the purposes of this war, that is the consequence of Lord Fisher's return to the Admiralty in November, 1914.

The limit of labour.

On March 7, 1916, in the House of Commons, Mr. Balfour, then First Lord, made a speech on the motion for Committee of Supply on the Navy Estimates, in which he said that the shipbuilding policy of his Board was directly continuous with that of its predecessors. The building resources of the yards, both those devoted habitually to ships of war and those devoted habitually to merchant ships, had been used to the utmost of their capacity for what in one sense or another were ships absolutely necessary for naval purposes. The whole process of making ships of war had been speeded up, continued Mr. Balfour, and never had it run at such a speed as it was running at that time. "Never had there been a greater desire," he added, "on the part of the Admiralty to vary the types of ships, not merely according to tradition, habit, or usage, but what appear to be the new and pressing necessities of the moment." He added, however:—

But there is a limit, not to our will but to our power. That is the limit of labour. I believe that only by bringing men from the front to provide new skilled labour, by the dilution of labour, or by inducing those now working to work more—only in these three ways is it possible that the efficiency of labour will be increased. That we have to accept, but up to the limits which labour offers us we are doing all that can be done in the way of shipbuilding.

Alleviating submarine losses.

In December, 1916, Mr. Balfour was succeeded by Sir Edward Carson, who, in his speech on the Navy Estimates of February 21, 1917, said that the Board of Admiralty were in a different position for framing programmes from those who occupied their position in previous years of the war. He said:—

Our programme must now be largely framed with a view of as speedily as possible alleviating the losses caused by the submarine menace. You cannot expect in any near time to lay down and complete great battleships, of which we have large numbers, and for which in his programme we owe a deep debt of gratitude to my right hon. friend the member for Dundee. We have arrived at an entirely different state of affairs, and are faced with an entirely different problem. We want to build, of course, such craft as will be most readily and soonest available, and we also want to make good the losses in the mercantile marine. Therefore, we have two, as it were, competing programmes. . . . We have appointed between the Admiralty and the Shipping Controller and the Board of Trade a *junta* to arrange how these necessary programmes are to be carried out, so that the most suitable yards may be appropriated to the most suitable kinds of ships. We are taking care, and I think we can assure the House, that not a single slip in the country will be left empty during the coming months.

In the first speech he made in the House of Commons after being appointed First Lord, Sir Eric Geddes, on November 1, 1917, after

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New dockyards opened.

referring to changes in administration, said it would not be wise to give any details of warship construction, except to say that the programme of warship and auxiliary ship construction then in hand was infinitely larger than had ever been undertaken in the pre-war history of the country. During the last twelve months, he added, the output of Royal Naval and auxiliary craft, measured in displacement tons, was between three and four times as much as the average annual output for the few years preceding the war. Sir Eric Geddes also stated that the growth of the Fleet had put a considerable strain upon the resources of the Royal dockyards and outside repairing establishments. Three large and one small new dockyards had been opened since the beginning of the war, and during one month the number of war vessels which completed repairs was nearly 1000, in addition to 1100 merchant ships.

Merchant *v.* warship construction.

A further important speech was made by the First Lord on the resolution for a Supplementary Vote of Credit on December 13, 1917. He then stated that our rate of output for shipbuilding was 18 per cent. in excess of the high-water mark of shipbuilding that this country had ever known. In addition to shipbuilding in this country, augmentations of our mercantile tonnage were being arranged throughout the Allied world, "and wherever the construction of ships of wood, concrete, or steel can be arranged, we and our Allies are taking the necessary steps to develop the industry and increase the output. We in this country are making a big experiment with concrete barges of 1000 tons capacity." Sir Eric Geddes proceeded to refer to the allocation of materials and labour as between merchant and warship construction. He said:—

> One must not lose sight of the fact that the merchant ship, though defensively armed, is not an offensive weapon against the submarine, and if we devote the whole of our available resources to building merchant ships, without, at the same time, developing our anti-submarine warship construction, we are simply sending vessels out to be torpedoed by an ever-increasing force of enemy submarines. It is incontrovertible that we can get a better net result in our merchant shipping position by devoting a proper proportion of our energy to building anti-submarine craft.

Steel shortage.

It was on this occasion that the First Lord said, that the submarine menace was held, but not mastered, and that our shipbuilding was not yet replacing our losses. He appealed for men to build ships, more ships, and still more ships; hitherto, there was a shortage of shipbuilding steel, and in other ways the authorities were not ready for an increase of man-power, but he now called for men and women not engaged on direct war work, or in the fighting forces, to go into the shipyards.

Reviewing the situation again, in introducing the Navy Estimates on March 5, 1918, the First Lord had to regret that the output of

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mercantile tonnage for January only reached 58,000 tons, compared with 140,000 tons in the fourth quarter of 1917. It should have been very much larger. An ultimate production, at the rate of 3,000,000 tons per annum, was well within the present and prospective capacity of our shipyards and marine engineering shops. Again, on March 20th, Sir Eric Geddes said that the urgency for naval vessels had, in the early days of the war, and, indeed, as late as 1917, made it necessary to place various types of these in practically every shipyard in the country. The Controller's Department realised that this policy was bad for output as a whole, and certain yards, or sections of yards, were allocated to one class of tonnage only. The result was that forty-seven large shipyards, containing 209 berths were wholly engaged on ocean-going merchant vessels, and apart from the large private warship building establishments, eleven other shipyards had some naval craft on their stocks. In dealing with the tonnage question, there were three factors:—(1) Patrol and other craft to destroy submarines and safeguard ships at sea ; (2) salvage and repair of damaged ships; and (3) building of new merchant ships. These three factors made one indivisible problem, for if the nation's energies were thrown into No. 3, we were simply providing sheep for the butcher's knife ; whereas, if we threw all our energies into No. 1, our land Armies in France and elsewhere might well be starved of men and munitions before we had completely won the war at sea. It was no easy task, therefore, to decide just what proportion of the available effort should be devoted to each of these three factors.*

Allocation of resources.

On the shipbuilding vote of the Navy Estimates, taken on July 30, 1918, Sir Eric Geddes was able to indicate all-round progress. Instead of losing tonnage, the world's net result in the quarter ending June 30th had been a gain of roughly 100,000 tons per month on the average. Repairs were absorbing a number of men, equivalent to 60 per cent. of the total number engaged on new production of merchant ships. Most important was Sir Eric Geddes' references to American help. He said :—

Tonnage loss arrested.

Up to now—and I am sure our Allies will not resent my saying this—this country has borne the burden, to a preponderating extent, of fighting the submarine; the new output of anti-submarine ships, mines, and appliances has been preponderatingly ours, and the responsibility of combating the menace has been ours. Even to-day the increased assistance brought about by new construction of our Allies is small indeed, but times are changing. The American programme, which they started when they came into the war, is now beginning to come along, and I have within the last few days had the privilege of considering it in detail with Mr. Roosevelt, the Assistant Secretary of the United States Navy Department. My conferences with him have confirmed what I have throughout relied upon, namely, that when once the flow of

* A speech on the question of the National shipyards and their work was made by Sir Eric Geddes in the House of Commons on July 10, 1918.

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destroyers and anti-submarine craft fairly starts from the United States it will become a formidable torrent. I look forward to the day when the Admiralty, in the no very distant future, will feel the relief of that torrent, and will be able to divert some portion of the country's resources from meeting the heavy demands for warships and auxiliary craft to the replacement of its Mercantile Marine losses. The effect upon labour for merchant tonnage new construction is obvious to the Committee. Warships take an enormous proportion as compared with merchant ships.

Prolonged war anticipated.

In order to further the co-operation of America, Sir Eric Geddes visited the United States in October. In New York, on October 12th, he issued a warning that a renewed effort on the part of Germany was impending. He advised his hearers not to be deluded by hopes of an early peace, but to be prepared for two years more of war. On October 25th, he made the following statement in reference to his visit:—

The real object of my visit was to impress upon America the need for increasing her anti-submarine effort. The German submarine effort was decreasing, owing to the naval measures taken against it, up to last May, when it became necessary to divert our hunting flotillas, both in existence and in preparation, from submarine chasing to escorting. Since then, owing to the sacrifice of our offensive against the submarine in order that the American troops might be safely brought over, the submarine has been growing upon us; and, should the present talk of peace lead to nothing immediate—and that is what those responsible for the Navies must necessarily assume to be the case; they must lay their plans for that—we may presently be in the position of having a very formidable submarine campaign to face. Therefore I sought to impress on America the need for enlarging her effort against the submarine. I found that Mr. Daniels was thoroughly in sympathy with this. He saw entirely eye to eye with my advisers and myself on the matter; so much so that he asked me to do the most unusual thing for a Minister of another country—to appeal, as I appealed in my speech to the Pilgrims, to the American yards to speed up their output.

Trend of policy.

The foregoing declarations of the respective First Lords of the Admiralty will serve to show the trend of the Government's policy in regard to naval construction, and the far-reaching influence exerted upon it by the submarine menace. The problem was complicated not only by labour difficulties and the shortage of materials and transport for materials, but also by the huge demand for merchant shipbuilding. When Sir Eric Geddes was appointed in May, 1917, as an additional member of the Board of Admiralty, with the title of Controller, he took over from the Ministry of Shipping the purchase, design, manufacture, and repair of standard and other mercantile ships of all classes. The first decision taken by the Controller was to separate as far as possible naval from mercantile work, and, as has been already shown, the majority of the cargo-boat yards were set free for merchant-ship tonnage. It was in January, 1917, that the standard ship programme was inaugurated. The progress of this and all other efforts at production were necessarily dependent to a large extent on the supply of skilled labour in the yards. In the early days of voluntary recruiting, no check was put upon the withdrawal of large numbers of young fit skilled mechanics for service in the Army, and it was these men whose services were indispensable

Skilled labour and recruiting.

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when the need for extreme pressure became urgent. It was then too late to replace them in full numbers, for some had been killed, others incapacitated from work, and others, again, could not be conveniently spared from their military duties. On this point, Sir Eric Geddes said on July 30, 1918:—

> The total net increase of labour in the last twelve months in firms engaged in the shipbuilding industries, shipyards, and marine engineering works is roughly 35,000. The original demand put forward a year ago was for an additional 80,000 men, part of whom were to be skilled, but, owing to events on the Western Front last autumn and in the early part of this year, and owing also to the great demands for technical staff for the Air Force and for the Army, it has been impossible—and the Committee, I think, will readily understand the point—to obtain the proper quota of skilled men by withdrawal from the Army. The number of additional men put into the shipyards has not so much been limited by the numbers of unskilled men as by the lack of skilled men necessary to make them useful.

American co-operation.

It was in spite of these enormous difficulties in regard to labour, materials, and transport, and of the pressing competition of mercantile tonnage, that the Admiralty carried through a large and complicated programme of naval construction, which added something like 50 per cent. to the displacement tonnage of the Royal Navy, representing a considerable increase in fighting capacity. It was the British units upon which fell the brunt of the work of hunting and destroying the submarines which for four years raided and sunk the world's merchant shipping. American co-operation, planned on a large scale, had not reached anything like its full effort when the Armistice was signed. As Admiral W. S. Sims said on October 11, 1918, there was an idea in the American mind that the United States Navy had been doing the bulk of the business over in Europe—at least a half. That was not correct, for there were, said the Admiral, about 5000 anti-submarine craft operating day and night, and the American craft numbered 160, or 3 per cent. The figures were about the same in the Mediterranean. Again, Americans seemed to regard it as a miracle of their Navy that they had got a million and a half troops here in a few months, and had protected them on the way. "We didn't do that," said Admiral Sims, "Great Britain did. She brought over two-thirds of them, and escorted a half. We escort only one-third of the merchant vessels that come here."

It is necessary to remember, in considering in detail the war shipbuilding programmes of the British Navy and their results, that the duties of the Fleet lay not only in combating the submarine warfare, but in providing convoys for merchant ships, and in meeting many and varied demands of a special character forced upon it by the exigencies of novel sea warfare. Yet every demand was fully met, and all the types of war-craft produced were represented in the efforts of the Allied seamen which brought the conflict to its successful conclusion.

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Pre-war programmes.

Turning now to the constructional work in the yards, when the war began there were battleships in hand and uncompleted of the programme of 1911–12, 1912–13, 1913–14, and 1914–15. Of the first programme, the Emperor of India and Benbow, sister ships to the Iron Duke, arrived at Berehaven on December 1, 1914, to work up after commissioning, and they joined the Grand Fleet at Scapa on December 10th. Of the 1912–13 programme, there were the five battleships of the Queen Elizabeth type, of which three were completed in 1915, and the Valiant and Malaya in February, 1916. The Queen Elizabeth herself was completed in January, 1915, and came into action on February 25, 1915, against the Turkish forts at Cape Helles. Three months later, on May 26th, she joined the Grand Fleet at Scapa. The Warspite had joined the Fleet there on April 13th; but the Barham did not arrive until October 2nd. The dates of the joining up of the Malaya and Valiant were February 18th and March 2, 1916. Next there were the five Royal Sovereigns of the 1913–14 programme, four being completed in 1916 and one in 1917. These were the last battleships laid down for the British Navy. The fourth programme in hand at the outbreak of war, that for 1914–15, included four battleships which had not been named or begun. Eventually, other vessels were substituted for them.

Iron Duke class.

All the foregoing ships were described to some extent in the *Naval Annual* for 1914, but further particulars are now available in regard to them. The Iron Duke class closely resembled in design the King George V. class, and was a further development of the Orions, of the 1909–10 programme, in which the principal armament of ten 13·5-in. guns had for the first time been placed on the middle line of the ship. For the secondary armament of the Iron Duke class a battery of twelve 6-in. guns, protected by 6-in. armour, was adopted. The stern torpedo tubes of the King George V. type were abandoned, and two additional broadside tubes substituted. The dimensions of the class showed a slight increase upon those of the battleships which preceded them, but although this was the case there were twenty-two British docks, sixteen of which were in the United Kingdom, capable of accommodating them. Details of the disposition of the armament of these ships were given in the *Naval Annual* for 1913, but it may be added that the secondary armament was for the first time provided with armoured control positions, and the director towers were placed upon the bridge. It may also be mentioned that, as a result of experience gained during the war, some further protection was given to the magazines by means of bulkheads and thicker decks. These battleships were the most recent to be completed at the time of the opening of hostilities, and the Iron

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Duke herself was the flagship of Admiral Jellicoe while he was Commander-in-Chief of the Grand Fleet. All four vessels were present at the Battle of Jutland, and the Marlborough was struck by a torpedo at 6.54 p.m. abreast of the starboard forward hydraulic engine-room, some 20 ft. below the water-line. Lord Jellicoe says in his book:—"The ship took up a list of some seven degrees to starboard, but continued in action so effectively that she avoided three more torpedoes shortly afterwards, reopened fire at 7.3 p.m., and at 7.12 p.m. fired fourteen rapid salvoes at a ship of the König class, hitting her so frequently that she was seen to turn out of line." The vessel continued in the engagement, and was able to keep up a speed of 17 knots until the following morning. She was able to rejoin the Fleet in August, although the work upon her was carried out in a floating dock; and the comparatively small damage caused by the torpedo illustrates the value of the protection given to the magazines and vitals of these ships.

Queen Elizabeth class.

The five ships of the Queen Elizabeth class were described in the *Naval Annual* for 1913 and 1914, and, as then stated, they contained many features which were not to be found in previous types of battleships. They were the first ships in the British Navy to carry 15-in. guns with a secondary battery of twelve 6-in. guns. They were the first battleships also to be entirely oil-fired. Protection is given on the sides amidships from 4 ft. below the load water-line to 16 ft. 6 in. above, the ship being protected by a belt of armour of a maximum thickness of 13 in., tapering to 6 in. at the main deck, and 8 in. at 4 ft. below the load water-line; and 6-in. armour above the main deck, tapering to 6 in. and 4 in. at the ends of the vessel. The protection against under-water attack is much more extensive than in earlier ships. All these vessels were submitted to the test of battle. The Queen Elizabeth herself was hastened to completion to take part in the Gallipoli operations, while the other four ships were engaged in the Battle of Jutland, and although all of them came under a heavy and concentrated fire from superior force, they sustained no vital damage, and were able to remain in action to the end. The Malaya was hit eight times.

1 and 2. Two hits, one indenting the upper armour plate, the other indenting and tearing the ship's plating below the armour.

3. A heavy shell struck the plates above the water line, pushing the plating back. The steam pipe to the siren was fractured by a splinter, escaping steam rendering communication with top impossible till shut off.

4 and 5. The galley, canteen, drying-room, and fittings on the gun deck were wrecked by a large shell passing through the forecastle deck and exploding in the 6-in. battery. No. 3 6-in. gun starboard was damaged and the mounting wrecked.

6 and 7. A large hole below the armour was apparently caused by two projectiles. The inner and outer oil bunkers 82-100 and wing compartments 82-109 were flooded; the seamen's bath-room 91-100 middle deck was flooded; and there were leaks into the adjacent compartments.

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8. X turret. A heavy shell struck the centre of the roof, rear end, bulging and perforating the roof slightly without exploding. The loading arrangements were also seriously damaged.

Experience gained in action.

After the battle, several additions in the way of protection were made to these ships as a result of experience. The principal points to which attention was directed by the experience gained in the action were thus described by Lord Jellicoe in his book on the Grand Fleet:—

(*a*) The urgent need for arrangements to prevent the flash of cordite charges, ignited by the explosion of a shell in a turret or in positions between the turret and the magazine, being communicated to the magazine itself. It was probable that the loss of one, if not two, of our battle-cruisers was due to this cause, after the armour had been pierced.

(*b*) Better measures were required to prevent the charge of small guns from being ignited by bursting shell, and to localise any fires due to this cause, in the case of guns of the secondary battery of large ships, and the main armament in small ships.

(*c*) Increased deck armour protection in large ships had been shown to be desirable in order that shell or fragments of shell might not reach the magazine. This need was particularly felt in all our earlier ships of the Dreadnought type, since their side armour was not carried to the upper deck level. The long range at which most modern sea actions are fought, and the consequent large angle of descent of the projectiles made our ships very vulnerable in this respect.

(*d*) The pressing need of a better armour-piercing projectile with an improved fuse was also revealed.

(*e*) Improved arrangements for flooding magazines and drenching exposed cartridges had to be made.

Lord Jellicoe added in his book that the action taken in connection with these matters was prompt, with the gratifying result that, before he relinquished the command of the Fleet, the great majority of the heavy ships had been provided with additional deck protection on an extensive scale and with fittings for rendering their magazines safe.

Royal Sovereign class.

The most salient difference between the Royal Sovereign class, as they were originally designed, and the Queen Elizabeths, which immediately preceded them, lay in the reversion to the combined use of coal and oil for fuel. While, however, the ships were in process of construction, this policy was reversed, and, as Mr. Churchill announced, oil fuel only was arranged to be carried. Although the armament was identical with that of the Queen Elizabeths, and disposed in a similar manner, there was a difference in the amount of protection given and its method of arrangement. The main belt of armour was 13 in. thick, extending from 5 ft. below the load water-line to the main deck, a depth of 12 ft. 9 in. This belt was carried forward and aft by 6-in. and 4-in. armour, and completed by transverse bulkheads. There was also a protective deck extending over the whole of the midship portion, its slopes being carried up to the full height of the belt. The armoured decks were from 1 in. to 2½ in. thick. The Royal Sovereigns were provided with turbine engines intended to develop 40,000 S.H.P., and a speed of 22–23 knots. There were eighteen boilers of the Yarrow type, arranged in three

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boiler rooms, six in each. A distinctive feature of these vessels was the single funnel. Owing to the war, trials were not carried out with all the ships of this class, but the following results were officially recorded on the measured mile at Skelmorlie:—

	Draught.	Corresponding Displacement.	S.H.P.	Revolutions.	Speed.	Estimated.
	ft. in.	tons.			Knots.	
Revenge 24.3.16.	33 1½	30,750	42,650	330	21·9	23 knots at 25,750 tons displacement (without bulge), and 40,000 S.H.P.
Ramillies (with bulge) 30.9.17.	32 1½	33,000	42,383	326	21·5	

A considerable number of alterations and additions were made to these ships as a result of the experience gained in the war. Only two of the ships, the Royal Oak and Revenge, were present at Jutland.

Agincourt.

In the *Naval Annual* for 1915 the taking over of the battleships Agincourt, Erin, and Canada from Turkey and Chile was recorded. The Agincourt was described in the *Naval Annual* for 1913, but it may be recalled here that she was begun in September, 1911, for Brazil as the Rio de Janeiro, having been designed by Mr. J. R. Perrett, Naval Architect of Messrs. Armstrong, Whitworth & Co. It was at first proposed to give her ten 15-in. or 16-in. guns, but ultimately the Brazilian authorities decided in favour of a 12-in. armament, and the final design providing for fourteen guns of this calibre, twin mounted in armoured gun-houses, all on the centre line, was settled by Mr. (now Sir) E. H. Tennyson d'Eyncourt. Launched on January 22, 1913, the vessel was sold in December of that year, while still unfinished, to Turkey, being formally transferred on January 9, 1914, and renamed the Osman I. She was ready for sea when war broke out and the British Government took her over. On August 26th, having been commissioned by Captain Douglas Nicholson, she joined the Grand Fleet off Noss Head. Her appearance marked her out from the rest of the battleships, and as Lieutenant Coleridge, R.N.V.R., of the Glorious, says in his book of sketches of the Grand Fleet, "during exercises at sea we used to count so many ships to left or right of Agincourt, as she was so different from our other ships." The alterations in the vessel when taken over for the British Navy included the removal of the flying deck over the two central turrets, the heavy boats on this deck being dispensed with. The torpedo-net defence was also removed and anti-aircraft guns installed. On her machinery trials for the Turkish Government the vessel attained a mean speed of 22·42 knots, for 40,000 S.H.P. at 342 revolutions.

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Erin. The Erin, formerly the Turkish Reshadieh, was described in the *Naval Annual* for 1912, her keel having been laid in the autumn of the previous year at the Barrow yard of Messrs. Vickers, where she was launched on September 3, 1913. The Ottoman Government required a vessel equal to the most powerful battleship being constructed in England, and the Reshadieh therefore resembled the British King George V. class. It is interesting, however—in view of Lord Jellicoe's remarks that, as each successive type of Dreadnought was designed, our constructive staff were faced with the fact that if they went beyond a certain beam the number of docks available would be insufficient—to notice that the Erin was given a breadth of 91 ft. 7 in., as compared with the 89 ft. of the King George V. type. This extra beam precluded her using any of the docks at Devonport.

As regards the table of weights, the hull absorbed 10,620 tons, armour 4207, armament 3912, machinery 2085, fuel at normal draught 1183, and ammunition 933—making up a total displacement of 22,940 tons, or about the same as the King George V. The armament was the same as in the latter, except that the super-posed 12-in. turret amidships was one deck higher in the Erin. At 28½ ft. draught, the guns in the fore turrets were at a height of 29½ ft. and 39 ft., and those in the aft turrets 22 ft. and 31½ ft. above the load water-line. The sixteen 6-in. guns in the secondary armament were disposed in a battery on the upper deck about 20 ft. above water. The main armour belt was of 12-in. thickness, tapering to 4 in. at the ends, and above it were two streaks of 9-in. and 8-in. armour respectively, while 5-in. armour was provided for the secondary battery and 12-in. for the conning tower. Modifications were made in the under-water protection after the vessel joined the British Navy. Commissioned by Captain the Hon. V. A. Stanley in August, 1914, she left Loch Ewe on September 17th in company with the Grand Fleet for the first time.

Canada. The Canada was begun at the same time as the Erin, but for Chile, her keel being laid as the Almirante Latorre on November 27, 1911, at the Elswick yard of Messrs. Armstrong, Whitworth & Co. She was launched on November 27, 1913, and was nearing completion when war broke out. Purchased on September 9, 1914, it was not until a year later that she was completed, joining the Grand Fleet at Scapa on October 15, 1915. As described in the *Naval Annual* for 1913, the design of the Canada followed the general plan of the King George V. and Orion, but 14-in. guns were substituted for 13·5-in. in the main armament. The installation of the more powerful secondary armament of sixteen 6-in. for twenty-two 4·7-in. guns increased the normal displacement from 27,400 to 28,000 tons, the mean draught

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from 28 ft. to 28 ft. 6½ in., and reduced the guaranteed speed to 22¾ knots. The main armour belt was 9 in. thick amidships, tapering to 6 in. and 4 in. at the ends. Armour 4½ in. thick protected the citadel between the main and upper decks, and the batteries and casemate containing the 6-in. guns had sides of 6-in. armour, while the main armament was protected by 10-in. armour.

Features of the Canada.

An interesting fact showing the well advanced condition in which the Canada was put afloat is that the weight of the vessel on the blocks at the time of the launch was 10,700 tons. As against her reduced side armour and under-water protection against torpedo attack, in comparison with contemporary British battleships, the Canada possessed greatly increased accommodation in her magazines and shell rooms when she was taken over. Director firing was installed subsequently, for which a complete rearrangement of the forward conning tower, bridges, and fighting tops on the mast was made. The two stump masts aft were replaced by a single short mast on the centre line, and the larger observer tower by a small torpedo-director tower, while the searchlight installation was modified and the height of the funnels reduced.

All three of these ex-foreign battleships were present at Jutland—the Agincourt, Captain H. M. Doughty, being in the First Battle Squadron; the Erin, Captain the Hon. V. A. Stanley, in the Second Battle Squadron, and the Canada, Captain W. C. M. Nicholson, in the Fourth Battle Squadron.

Tiger.

Only one battle-cruiser, the Tiger, of the 1911-12 programme, was in hand when war broke out, and this vessel, for which the contract was placed in April, 1912, the keel laid in June of that year, and which was launched on December 15, 1913, was in an advanced stage. Captain H. B. Pelly was appointed to her on August 3, 1914, and she was completed and joined the Grand Fleet about two months later. A brief description of the design appeared in the *Naval Annual* for 1914. In her main features, the Tiger resembled the Queen Mary, but with 6-in. instead of 4-in. guns in the secondary armament, and with two submerged torpedo flats, one forward and one aft, in place of one submerged flat forward. Her normal displacement was 28,500 tons, but, when fully loaded for sea, with 3240 tons of coal, and 800 tons of oil, the estimated displacement was 32,800 tons, with a draught of 32 ft.

Engines of Tiger.

After the original design was approved, it was decided to increase the S.H.P. from 85,000 to 108,000, so as to increase the speed at legend displacement from 28 to 30 knots. The Tiger was the first British capital ship to be propelled by turbines of the Brown-Curtis type. The engines, manufactured by the builders of the hull,

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Messrs. John Brown & Co., Clydebank, consisted of a four-shaft turbine arrangement, each shaft being available for ahead and astern working. The two engine rooms were divided by a middle line bulkhead, and there were also two condenser rooms on the aft side of these. There were thirty-nine separate water-tube boilers of the Babcock and Wilcox type, loaded to 235 lb. per sq. in., arranged in five boiler rooms, with seven in the foremost boiler room and eight in each of the others.

Armament.

The armament consisted of eight 13·5-in. Mark V. guns in four turrets on the centre line; twelve 6-in. Mark VII. 45-calibre guns, ten on the upper and two on the forecastle deck, and four submerged 21-in. torpedo tubes. The maximum thickness of the armour on the sides was 9 in., with varying degrees of thickness down to 3 in. The maximum thickness of the barbette armour was also 9 in., while the conning tower had 10-in. and the control tower 6-in. armour. After the Battle of Jutland, additional deck armour 1 in. thick was fitted as a protection to the magazines of the ship. As revised, the maximum thickness of the plating on the forecastle and upper decks, and the magazines and shell rooms, was 2½ in., and on the lower deck 3 in. At the Jutland Battle, commanded by Captain H. B. Pelly, the Tiger was hit four times. Two of her turrets were hit, and two heavy guns put out of action. She also sustained damage forward.

Repulse and Renown.

It will be remembered that the 1914-15 programme included four battleships, two of which it had been decided should be constructed by private builders, and contracts had been entered into with Messrs. Palmer's and the Fairfield Co. for these vessels. They were to be of the Royal Sovereign type, and named Repulse and Renown. While yet in a very early stage of construction, the Battle of the Falkland Islands was fought, and the experience of that battle, as well as that in the Heligoland Bight, on August 28, 1914, indicated the immense value of high speed, coupled with long range powerful gunfire, and large radius of action; these qualities in association enabling a ship to run down those of the enemy under any circumstances, with the power of enforcing or declining action as expedient. On December 19, 1914, the Director of Naval Construction was informed that a new battle-cruiser design was required. The vessel was to have a speed of 32 knots, with six 15-in. guns. The armoured protection was to be comparatively light, in order to obtain the increased rate of speed. It was to the initiative of Lord Fisher, then First Sea Lord, that this design was chiefly due. It was decided to cancel the contracts for the Repulse and Renown, and to complete these vessels as battle-cruisers of the new design. As Messrs. Palmer's were unable to build a vessel of the length required

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(750 ft.), Messrs. John Brown & Co., Clydebank, were given the order for the cruiser Repulse. The material ordered and delivered at the Palmer's and Fairfield yards for the battleships was used as far as possible for the battle-cruisers.

Dates of completion.

On January 25th the keels of both vessels were officially laid down. The Repulse was launched on January 8, 1916, the launching weight being 15,156 tons, and the Renown was launched on March 4, 1916, with a weight of 16,065 tons. The steam trials of the Repulse took place on August 15, 1916, and her gun trials three days later. On her way to join the Grand Fleet, she carried out progressive measured mile trials on September 15, 1916, and on the 21st she joined the flag of Sir John Jellicoe at Scapa. The ship was thus built by the contractors within nineteen months from the date of laying down, which, considering she was of novel type, constituted not only a world record but a particularly fine performance, reflecting the highest credit upon the ingenuity and organising powers of the leaders in the industries affected. The Renown left the Fairfield Yard on September 18, 1916, carried out her gun trials on the following day, and a steam trial on the 20th. She was thus only a little over a month behind her sister ship.

Admiralty commendation.

On September 25, 1916, the Lords of the Admiralty forwarded a letter to the Director of Naval Construction, expressing and conveying to him and to the members of his staff concerned, "their appreciation of the highly satisfactory and expeditious manner in which the work of designing, building, and completing the Repulse had been carried out."

The main features of the design of these ships, as compared with those of the Tiger, were as follow:—

	Repulse.	Tiger.
Length between perpendiculars	750 ft.	660 ft.
Length over all	794 ft.	704 ft.
Breadth	90 ft.	90½ ft.
Mean draught	25½ ft.	28½ ft.
Displacement	25,500 tons	26,500 tons
Designed S.H.P.	120,000	108,000
Speed at load draught	32 knots.	30 knots.

Machinery and protection.

As it was necessary that the ships should be completed as quickly as possible, the proposition was accepted to duplicate the machinery of the Tiger, with some additional boilers. Considerable economy of time was made possible by this plan. The turbine machinery was of the Brown-Curtis type, with forty-two Babcock and Wilcox boilers, arranged to burn oil fuel only. So far as protection was concerned, the Invincible class of ship was taken as the standard type, and the barbettes, as in that vessel, had a thickness of 7 in., and the armour belt a thickness of 6 in. over the length occupied by the

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machinery and magazines, with 4 in. forward and 3 in. aft on the extensions, the depth of the belt being 9 ft. The armoured bulkheads were 4 in. and 3 in. thick, with 1½-in. protection to the funnel casings. The 15-in. gun turrets had 9-in. armour in front and 7-in. armour at the sides, with heavy steel roof plates. The protection was certainly light in order to obtain the speed, but the displacement and draught were less than in the Lion or Tiger, and although the belt armour was rather thin, the internal protection of the decks was equal to that of these battle-cruisers. With the experience gained at the Battle of Jutland, considerable alterations were made to improve the belt, deck, and under-water protection. These further additions to the armour made the vessels compare favourably with the Lion and Tiger in regard to protection, as they already did in regard to armament and speed.

Armament.

As already stated, the main armament consisted of six 15-in. guns, mounted on the middle line, two pairs in barbettes forward, and one pair aft. The two pairs forward are respectively 35 ft. and 45 ft. above the water-line, and the guns of the after barbette are 23 ft. above it. All the guns have 20 degrees elevation. The secondary battery for anti-torpedo-boat defence consisted of seventeen 4-in. guns, fifteen in triple gun mountings and two singly. The weight of a broadside from the main armament was 11,520 lb. The ships had also two 3-in. anti-aircraft guns, and two 21-in. submerged torpedo tubes. The steam trials of the vessels were most satisfactory. Turning trials showed that they had a tactical diameter of about 4·3 times their length, and reports from their commanding officers were to the effect that they behaved very well in a considerable sea. The only opportunity they appear to have had in action was on November 17, 1917, when a scrap took place in the Heligoland Bight.

Hood class.

From the foregoing it will be noted that, whereas in the Queen Elizabeth class a disposition was shown by the naval authorities to call for a design which approximated to the battle-cruiser in speed, while retaining other qualities of the battleship, this attitude showed a change when the Royal Sovereigns were ordered. Directly, however, that war was declared, the Royal Sovereigns were altered to oil-burning vessels, in order to increase their speed. The next step was indicated by the change of the Repulse and Renown from battleships to battle-cruisers. What the next development was to be was shown by the Hood class. Here there appeared to be a complete blend of the two types, and the gun-power, speed and protection were provided for in such a manner that no one quality was sacrificed for the other. The cessation of hostilities, however, interfered with the completion of three of the vessels of this design,

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and Mr. Long said on March 12th that the Howe, Rodney and Anson, which were still in early stages of construction, had been abandoned. The estimated date of the completion of the Hood, the only capital ship under construction in March, 1919, was November, 1919.

"Hush-hush" cruisers.

It is no secret now that when Lord Fisher returned to the Admiralty as First Sea Lord in October, 1914, he had conceived a plan of offensive operations which required for its execution special classes of vessels. In the great programme of shipbuilding authorised at the time, there was not only provision made for the destroyers and mine-sweepers, so much needed in the North Sea, but for other types, entirely novel, which were to be used in the execution of this plan. The most striking of these new vessels were those which were vulgarly described as the "hush-hush" ships. There were three vessels which particularly answered to this description, owing to the abnormal and peculiar features of their design and the secrecy maintained in regard to them. It has already been noticed that the Renown and Repulse owed their inception to the experience gained at the Falkland Islands battle, but the special need which was now to be met was for ships powerfully armed and of high speed, and yet able to navigate shallower waters than any vessel already in existence of similar armament and protection. The new vessels were officially described as large light cruisers. They were to carry few guns, but these of the heaviest calibre. The protection was to be exceptionally light, the speed not less than that of the Renown class, and the draft not to exceed 22 ft., or something like 5 ft. less than that of any existing capital ship.

Courageous and Glorious.

The armament decided upon for the first two vessels, the Courageous and Glorious, consisted of four 15-in. guns, in two turrets on the middle line, one forward and one aft; the anti-torpedo armament was to be eighteen 4-in. guns in six triple mountings, twelve firing on either broadside; there were also two 3-in. anti-aircraft guns, four 3-pdrs., and five Maxims; and the armament was completed by two submerged torpedo tubes, but subsequently six pairs of 21-in. torpedo tubes were fitted on the upper deck. As to protection, there was no side armour proper, but 2-in. plating, connected to 1-in. plating behind, was fitted from below the water-line to the forecastle deck over the length of the machinery spaces and magazines, in a similar manner to the protection given in the C class of light cruisers. A protective deck was also given covering the vital parts of the ship. Under water, the form over a considerable length amidships was bulged out, and a protective longitudinal bulkhead was fitted on each side of the vessel. These elements in the design afforded some measure of security against

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under-water explosion. Transverse protective bulkheads were also fitted forward and aft. The 15-in. barbette towers were of 6-in. and 7-in. armour, with gun shields of 9-in. and 7-in. armour and a heavy roof plate. The armour on the conning tower was 10 in. thick. In comparison with that given to any other capital ship of modern date, this amount of protection would certainly not be considered to entitle the Glorious class to be reckoned as armoured ships at all.

Machinery and speed.

The propelling machinery was of a type which had been fitted in the light cruiser Champion, and consisted of a four-shaft arrangement of geared turbines, the power being transmitted to the propeller shafts by double helical gearing. The estimated S.H.P. of each set of turbines was 22,500, giving a total S.H.P. of 90,000 at about 340 revolutions. There were eighteen boilers of the Yarrow small tube type, arranged in three boiler rooms, six in each. All the boilers were oil-fired, and the quantity of oil fuel carried was 3250 tons, in wing tanks and double bottoms. This gave a radius of action considerably greater than that of light cruisers of the ordinary type. The speed was laid down at 32 knots with the vessel at legend displacement. This rate has been exceeded on service.

The principal dimensions of these two vessels, as designed, were:— Length between perpendiculars, 735 ft., overall, 786 ft. 3 in.; extreme breadth, 81 ft.; draughts to load water-line, fore, 21 ft., aft, 22 ft.; displacement to load water-line, 18,600 tons. It will give some idea of the great length of these ships when it is pointed out that they are half as long again as the Dreadnought. The special feature of the design, of course, was the extremely light draught of 21½ ft., presenting a greatly reduced target to torpedoes and mines, and, moreover, permitting the vessel to navigate channels which would be impossible to heavier ships carrying such powerful guns.

Period of building.

It was the original intention to build these vessels within the year, and the first drawings and body plan were sent out on February 6, 1915, to Armstrongs, at Walker, for the Courageous, and to Harland and Wolff, at Belfast, for the Glorious. The engines for the Courageous were made by Messrs. Parsons, and for the Glorious by Harland and Wolff. The following table gives the period of building for the two vessels:—

	Courageous.	Glorious.
Keel plate laid	March 28, 1915.	May 1, 1915.
Vessel launched	February 5, 1916.	April 20, 1916.
Vessel commissioned	October 28, 1916.	October 14, 1916.
Trials begun	November 14, 1916.	October 23, 1916.

The need for stiffening the hull of ships of such great length, in order to guard against ill effects from the strain when they were driven at full speed in a rough sea, was demonstrated in the

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Courageous when working up for her full power-trials in January, 1917, and additional material was therefore worked into both vessels. Other slight modifications have been made since their completion.

The third ship of the class was named the Furious, and she also was built at Armstrongs, and engined by the Wallsend Slipway and Engineering Co. Generally the characteristics of this vessel were similar to those of the Glorious and Courageous, the leading features of the design being as follows:—Length between perpendiculars, 735 ft., extreme, 786½ ft., breadth, 88 ft., draught to load water-line, forward, 20½ ft., aft, 21½ ft.; displacement to load water-line, 19,100 tons. The armour and protection arrangements were very similar to those of the other two large light cruisers, but the under-water defence was more pronounced, the bulge being in the nature of an appendage, whereas in the Courageous class it was incorporated in the structure. The keel of the Furious was laid on June 8, 1915, and the ship was launched on August 15, 1916, and commissioned on June 26, 1917. Originally it was intended that the principal armament of the ship should consist of two 18-in. guns, carried in two barbettes, one forward and one aft. It was also intended that the Furious should carry eleven 5·5-in. guns as well as smaller pieces. However, on March 2, 1917, before she was commissioned, it was decided to fit her as a seaplane carrier. This entailed doing away with the foremost gun, and a large hangar was built on the forecastle deck. In the autumn of the same year it was decided to remove the after gun also, and to fit a flying-on deck with a length of about 300 ft. This alteration was carried out during the winter of 1917–8. The 5·5-in. armament was reduced to ten guns, and four sets of triple 21-in. above-water torpedo tubes were fitted. A full-power four hours' trial of the ship gave a mean speed of 31½ knots on a displacement of 22,100 tons, and the highest S.H.P. reached was 94,000 at 339 revolutions per minute. Furious.

The construction of light cruisers during the war was developed, in common with that of other types, in response to increasing demands from the Fleets. At the date of the commencement of hostilities, the latest class of light cruisers completed were those of the Chatham class, of the 1910–11–12 programmes. These were the first light cruisers to be given vertical side plating. In other respects they resembled the earlier Falmouth class, with 150 tons additional displacement. A second trio of Chatham cruisers, the Birmingham, Nottingham, and Lowestoft, were built under the 1911–12 Estimates, and were in commission when war broke out. The light cruisers of the 1912–13 programme were the eight Arethusas, to which it was proposed to give the armament of the Fearless, the protection of the Chatham class.

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Chatham class, and a considerably increased speed—30 knots—which was to be made possible by the adoption of oil fuel and fast-running machinery of the destroyer type. The Arethusas were completing when the war began, and the name-ship was commissioned at Chatham on August 11, 1914, as Commodore Tyrwhitt's flagship, and on the 28th was in action in the Heligoland Bight. The Aurora was commissioned on September 5, 1914, at Devonport, and the other six ships at various dates up to March 19, 1915, when the Royalist was passed into service. The Arethusa was unfortunately lost by striking a mine on February 11, 1916.

Arethusa class.

The armament of the class as finally approved was two 6-in. B.L. guns on the middle line, one forward on the forecastle deck and one aft on the upper deck; six 4-in. Q.F. guns, three port and three starboard on upper deck; and two double revolving 21-in. torpedo tubes on the upper deck amidships. A 4-in. anti-aircraft gun and two double revolving 21-in. torpedo tubes were added on the upper deck aft at a later date. There was no side armour proper, but protective side plating was fitted to a thickness, including the hull plating, of 3-in. amidships, 2-in. and 1½-in. forward, and 2-in. aft. Both at Heligoland and on April 25, 1916—when the German battle-cruisers bombarded Lowestoft, and attacked the Penelope and Conquest—the Arethusa design was tested under fire, but the ships concerned withstood several hits from 12-in. shells successfully, and were repaired after the fighting. The propelling machinery consisted of four independent turbines, the Brown-Curtis type being fitted in the Arethusa and Undaunted, and the Parsons type in the other ships. The maximum speed was 30 knots, to attain which, with the vessel at the legend displacement of 3512 tons, a S.H.P. of 40,000 was estimated for. Oil fuel only was used. Measured mile trials run by two ships of the type gave the following results:—

	Undaunted.		Aurora.			
Mean speed	27·33	28·47	26·58	27·40	28·33	28·93
Mean revolutions. . . .	557·1	599·1	545·1	580·61	607·36	657·2
Mean S.H.P.	31,345	38,252	25,845	31,290	35,015	41,786
Displacement during runs .	3,505	3,480	3,593	3,560	3,517	3,495

It should be mentioned that these trials were over different courses, those of the Undaunted at Skelmorlie, and of the Aurora at Polperro.

Calliope class.

The 1913–14 programme also included eight light cruisers, of what has since been known as the C class. Ordered in the summer of 1913 these vessels were in various stages of construction

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when the war began. The first completed—in the record time of eleven months—was the Caroline, in December, 1914, and the others were all passed into service during the following twelve months. In this class the displacement was increased by 238 tons to 3750 tons, and the 4-in. guns increased from six to eight. In the Calliope and Champion, instead of two 21-in. deck tubes, submerged torpedo tubes were fitted, space being obtained by having only six boilers instead of eight. Ten feet was added to the length, but the draught was lightened, and the horse-power and speed remained the same. The question of geared turbines was considered in relation to the design of these ships, and a trial was given in the Calliope, with four shafts, and the Champion, with two, to Parsons pinion geared turbines, the efficiency of electric transmission and its reliability for warship service not being then considered sufficiently established to warrant its adoption. The Parsons pinion geared turbines in the Champion proved so successful that the engines of this vessel were adopted as the standard type for many of the succeeding light cruisers, including the light cruisers of the Courageous type. The Carysfort had Brown-Curtis turbines, but the remainder of the Calliope class were fitted with Parsons direct-drive turbines on four shafts, the outer of which also carried geared cruising turbines. These differences in machinery naturally lent additional interest to the trials. The Champion, one of the geared-turbine ships, had a mean speed during six runs of 28·2 knots at 305 revolutions at 31,418 S.H.P., and a mean speed during four runs of 29·5 knots at 337 revolutions at 41,188 S.H.P. Although the speed did not reach the expected 30 knots the result was satisfactory, particularly as the cruiser was slightly above her legend displacement. The Carysfort, with direct-drive Brown-Curtis turbines, developed 28·4 knots during a four hours' trial by bearings, the revolutions being 540 and H.P. 32,574; while the Caroline, with direct-drive Parsons turbines, maintained 29·1 knots over 4 miles at 586 revolutions and 40,780 S.H.P., and 27·3 knots over 6 miles at 528 revolutions and 31,402 S.H.P.

Additional Calliope class.

In the 1914–15 programme there were four light cruisers, which had not been ordered when war began. They were named Castor, Constance, Canterbury, and Cambrian, and came into service in the order named between November, 1915, and August, 1916. Two scout-cruisers were in hand at Messrs. Armstrong's in 1914, for Turkey. The design of these was altered to that of improved C's, and they became the British light cruisers Centaur and Concord. A significant change in the armament of these six ships was the adoption of one calibre only—6-in.—some having four and others five. All were placed on the middle line, all could fire on either broadside,

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and also could be fought in bad weather. The Centaur and Concord were the first light cruisers to have tripod masts.

Caledon and Ceres classes.

In the special 1915–16 programme nine light cruisers were included. The armament was the same as for the 1914–15 ships, but four 21-in. double revolving torpedo tubes were fitted on the upper deck. There was a slight increase of length and beam. The first four of these cruisers were known as the Caledon class—Caledon, Caradoc, Cassandra, and Calypso. The other five—Cardiff, Ceres, Curacoa, Curlew, and Coventry—were improved by the second 6-in. gun from forward being mounted on a superstructure to fire over the first gun, which in addition to increasing the bow fire also permitted the bridges and mast to be placed at a greater distance from the bow. Five additional light cruisers—the Carlisle, Colombo, Cairo, Capetown, and Calcutta—were ordered in July, 1917, to be of similar type to the Ceres, except that they were to be fitted with an aeroplane hangar.

Birkenhead and Chester.

Attention must now be directed to the two light cruisers building at the yard of Messrs. Cammell Laird, Birkenhead, for the Greek Navy when war began. It was understood that they were to be called the Admiral Condouriotis and Lambros Katsonis, but they were purchased in 1915 and renamed the Birkenhead and Chester. In design they were similar to the Chatham, with a displacement of 5250 tons, an armament of ten 5·5-in. guns so arranged on the upper and forecastle decks as to enable six to fire on either beam, and two submerged torpedo tubes. Both were fitted with Parsons direct turbines, and four screws, but whereas the Birkenhead, which was coal and oil fired, had a speed of 25 knots with 25,000 H.P., the Chester, fitted to burn oil fuel only, had a speed of 26½ knots with 31,000 H.P. The Birkenhead, completed in September, 1915, joined the Grand Fleet in the same month, and was present at Jutland in the Third Light-Cruiser Squadron. The Chester was only completed in May, 1916, and in the same month fought at Jutland. She encountered enemy light cruisers and engaged them for eighteen minutes, sustaining a loss of thirty-one killed and fifty wounded. Three guns and her fire control circuits were disabled, and she had four shell holes a little distance above the water-line. The vessel was detained at Hull for two months, till July 29th, by her extensive injuries—longer than any other ship in the battle except the Marlborough.

D class.

While the C class were satisfactory for the work required of them, a heavier type was called for in 1916, in reply to new German cruisers, and the D class, with six 6-in. guns and a knot less speed, on a displacement of 4650 tons, was designed, the Danae,

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Dauntless, and Dragon being ordered in September, 1916, and finished just before the armistice. Compared with the Ceres, the D's were 20 ft. longer, 2½ ft. broader, and had 9 in. more draught. The H.P. of 40,000 was the same, but the revolutions at full power were reduced from 290 to 275. Four triple—instead of two twin—deck revolving torpedo tubes were fitted. Three more ships—the Delhi, Durban, and Dunedin—were ordered in July, 1917, and a further five—the Daedalus, Daring, Despatch, Diomede, and Dryad—in March, 1918. The main features were the same as the original three, but an increased beam of 6-in. was provided in the last five vessels.

Raleigh class.

A new type altogether, to deal with enemy raiders in any part of the world, was evolved in 1915, and five vessels ordered at the end of that year. Compared to the speed with which Lord Fisher's programme was executed, these vessels made slow progress, only one—begun as the Cavendish but renamed the Vindictive—being finished before the armistice, and this vessel had been converted into an aircraft carrier. The Raleigh, Frobisher, Hawkins, and Effingham, as the others were named, were improvements on the Birmingham, with greatly increased armament, and a speed equal to the 30 knots of the C type. The displacement was 9750 tons, or an increase of over 4000 tons on that of the Birmingham, and 5500 tons on that of the Ceres. The seven 7·5-in. guns were mounted on light C.P. mountings with shields, five on the centre line, and two on the beam near amidships. By superposing at the bow and stern, a fire of four guns in either direction was given, with six guns on either broadside. A new form of hull construction for such vessels, based on that of the Furious, was adopted, moderate bulges, with a maximum of 5 ft., being provided over the greater part of the hull, while the sub-division admitted of any two main compartments being flooded without endangering the ship. It was originally decided, in view of the ships being required for service anywhere, that they should not be dependent upon one kind of fuel only, and should be able to burn both coal and oil, but in 1917 a reversion to oil only was made, the change being expected to give an increase of 10,000 H.P. in the Raleigh and Frobisher.

L and M classes.

When war began, the L class of destroyers, built under the 1912–13 programme, were the latest in commission. Seven of this type were still awaiting completion. The M class, of 1913–14, were in hand, and of the thirteen of this type, the Milne, Moorsom, Morris, Matchless, Murray, and Myngs were building to Admiralty design; the Miranda, Minos, and Manly to that of Messrs. Yarrow; the Meteor and Mastiff to that of Messrs. Thornycroft; and the Mentor

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and Mansfield to that of Messrs. Hawthorn Leslie. There were considerable minor differences between these respective designs, but in main features they were alike, providing for an armament of three 4-in. Q.F. Mark IV. guns, on P. IX. mountings, with 20 degrees elevation. The designed speed of the Admiralty boats was 34 knots, that of the others 35 knots. These thirteen boats were delivered by April, 1915. On trial, the Moorsom, of Admiralty design, with 883 tons displacement, made 34·4 knots, and the Mastiff, a Thornycroft boat displacing 884 tons, 37·2 knots.

M class continued.

In the 1914–15 programme there were twelve destroyers, which were not in hand when hostilities began. In September, 1914, twenty more destroyers of the M class were ordered, and further repeat orders were placed in November, 1914 (thirty-two), February, 1915 (eighteen), and May, 1915 (twenty); so that altogether ninety M class vessels were built after war had begun, in addition to the thirteen previously ordered. The later boats, although of the M type, were given names beginning with the letters M, N, O, and P. One of the Yarrow boats, the Mounsey, with a displacement of 798 tons, made a speed of 38·6 knots over the Skelmorlie course. Following the ramming of an enemy submarine by the Badger in 1914, a sharp, square ram stem and doublings were fitted to the destroyers building —and also to certain of those in service—with the idea of stiffening the structure for similar offensive action against the U-boats. In regard to propelling machinery, the boats of Admiralty design were given Parsons turbines, while in some of the private designs Brown-Curtis turbines were fitted.

R class.

Following the M class, a design of similar dimensions and form, but different machinery, known as the R type, was adopted in July, 1915, and orders placed for twenty-six vessels. Orders for ten more in December, 1915, and fifteen more in March, 1916, were also placed, making the total of the class fifty-one. All the boats were fitted with geared turbines on two shafts, and the designed speed was 36 knots —two more than in the M type—with 27,000 H.P. at 360 revolutions. The increased speed was due to the extra boiler power obtainable, and the increased propulsive efficiency. In this connection, comparative trials held in August, 1916, between the Romola, of the R class, and the Norman, of the M class, demonstrated the propeller efficiency at high and low speeds to be appreciably greater in the geared turbine vessels. The gain in steam economy at 25 knots was about 25 per cent., and at 18 knots about 12 per cent., due to the higher revolutions of the turbines, which was equal to an increase of fuel economy (and resulting radius of action for the same capacity

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of fuel) of 28 per cent. at 25 knots and 15 per cent. at 18 knots. On trial over the Skelmorlie course, the Rigorous, of the R type, completed in November, 1916, with a displacement of 940 tons, developed 28,200 H.P. and a speed of 36·5 knots.

Trenchant class.

A modification of the R class, the Trenchant type, was introduced in March, 1916, and eleven vessels built to the new design. These were at first ordered to be repeats of the R's, but owing to the desire to move the bridge as far aft as possible in order to give increased protection to the *personnel* in bad weather, certain alterations were necessary, including a rearrangement of the positions of the torpedo tubes and pom-pom. An improvement in armament was also effected by mounting the 4-in. guns on C.P. Mark III. mountings, giving 30 degrees elevation instead of 20 degrees, and increasing the range to 12,000 yards.

V class.

In the spring of 1916, developments in German torpedo craft gave a new turn to British destroyer construction. It was considered necessary to have boats of greater gun power than the R class in order to be able to deal with the heavier armament which was being given to German torpedo boats. In this connection, it may be recalled that when on the night of February 10, 1916, German torpedo craft made a raid on the Dogger Bank and sank the Arabis, the Admiralty announced that the enemy flotilla was composed of new and heavily armed destroyers. Following on the adoption of geared turbines in the R class, the Admiralty had already designed, and ordered in April, 1916, a new flotilla leader with similar machinery, and with an armament corresponding to that of the Kempenfelt, which will be described later. In order, therefore, to obtain a class of twenty-five new large destroyers within the shortest possible time, they were ordered to be of the same type as the V class flotilla leaders, with the accommodation modified to suit their different work. Ordered in July, 1916, this group of vessels came into service by May, 1918. The Vivien, completed by Messrs. Yarrow to Admiralty design, on a trial over the Skelmorlie course, with a displacement of 1142 tons, made a speed of 36·2 knots, with 377 revolutions per minute.

W class.

After the V came the W class, comprising twenty-one boats, ordered in December, 1916, and completed by June, 1918. These were repetitions of the earlier class, except that 21-in. triple torpedo tubes were supplied in place of double tubes, and the wireless installation was modified. The Thornycroft destroyer Wolsey, of this later type, completed in May, 1918, during a trial based on bearing observations between Ventnor Pier and St. Catherine's Point, Isle of Wight, where the Channel is comparatively shallow, gave the

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following results, which are also compared with the figures of another trial run by this vessel at Skelmorlie :—

Course.	Displacement.	Revolutions.	S.H.P.	Speed.
		p.m.		knots.
St. Catherine's	1,188	390	32,800	38·2
Skelmorlie	1,206	382	32,600	36·6

S class.

In the next class, of the S type, there was a return to smaller dimensions. By this time (April, 1917) it had been ascertained that the Germans were likely to have but a small number of heavier destroyers with superior gun-power. It was even possible they had only the four ex-Argentine vessels which were appropriated to the duty of and which corresponded in size to the flotilla leaders. These were vessels of from 1200 to 1400 tons, 32 knots speed, and burning oil fuel only, originally named the Santiago class. They were ordered from Krupp's Germania yard a few months before the war to replace four boats sold to Greece. As soon as it was decided that the number of British large destroyers was sufficient to meet these and any others which could have been provided by the German yards, the Admiralty reverted to a class of smaller, cheaper, and faster destroyers, which could be produced more quickly. The S class included thirty-three vessels, which were ordered in April, 1917, and the first four units of which were completed in May, 1918. They were of the same general design as the improved R class (Trenchant type), ordered about a year earlier, of which the Trenchant herself was completed by Messrs. White, of Cowes, in April, 1917. The armament, however, was increased by the addition of a single 18-in. revolving torpedo tube on either side of the upper deck at the break of the forecastle. The S class were the first to have the system of director firing and distant control of search-lights installed. This necessitated an increase in the size of the bridge and charthouse in order to accommodate the control officers. In order to reduce weight, certain omissions included the ram stem and doublings, and the steam heating in officers' quarters, while there was also a reduction of the fresh water and coal capacity for culinary purposes. Instead of the previous radiating system, the electrical ring main system was fitted. On trial at Skelmorlie, the Scout, one of the boats of Admiralty design, with a displacement of 1171 tons, and engines making 334 revolutions, reached a speed of 33·4 knots. The Torch, of Messrs. Yarrow's design, displacing 809 tons, and with 691 revolutions per minute, made 39·2 knots—apparently the highest rate of speed attained at that time over the

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Skelmorlie course. A further order for S destroyers, thirty-six in number, was given in June, 1917.

Later W class.

The last class of destroyers for ordinary service to be ordered during the war were repetitions of the W class. The Admiralty ordered sixteen of these vessels in January, 1918, and thirty-eight in April. The determination to build more of these large-type destroyers at this date reflected the general view that the war might be unduly prolonged. Several boats of the V and W groups had by this time been tried, and had demonstrated their superiority over the smaller R destroyers. The chief requirement in the new vessels was, however, guns of greater range, and instead of the four 4-in. Q.F. weapons in the Vanoc and Wakeful types, the improved W's were given four 4·7-in. B.L. Mark I. guns, with a 3-in. anti-aircraft gun and two sets of triple 21-in. torpedo tubes. These vessels, displacing from 1300 to 1350 tons, are thus the largest, most heavily armed and most seaworthy destroyers ever built for the British Navy.

Pre-war flotilla leaders.

A most important phase of the destroyer programmes of the war was the attention given to the provision of flotilla leaders. It may be recalled that two vessels of this description were authorised in 1913–14, the Lightfoot and Marksman, and two in 1914–15, the Kempenfelt and Nimrod. These four entered service in the autumn of 1915. They were designed for 34 knots, two knots less than the Swift, built as an experiment in this direction in 1907, but eight or nine knots greater than the Active and Fearless types which were doing duty as flotilla leaders at the beginning of the war. The machinery consisted of triple-screw, direct coupled turbines, with four boilers in two single and one double boiler room; and there were four funnels. The armament comprised four 4-in. Q.F. Mark IV. guns on P. IX. mountings, with 20 degrees elevation, all the guns being on the centre-line—one on the forecastle, two on platforms between the funnels, and one aft. Two pairs of 21-in. double revolving torpedo tubes were provided. In 1917, these were supplemented in the Lightfoot and Nimrod by two 14-in. tubes. During the war nine more leaders of similar type were ordered—the Abdiel, Gabriel and Ithuriel in November, 1914; the Parker and Grenville in February, 1915; the Hoste, Seymour and Saumarez in July, 1915; and the Anzac in December of the same year. The Abdiel was converted, while building in 1916, for minelaying duties, and the Hoste was lost in collision on December 21, 1916.

V and S flotilla leaders.

Two new classes of leaders were introduced in the spring of 1916, the Valkyrie and Scott groups. Geared turbines were fitted in these classes. Although of the same calibre as those of the Kempenfelt, the Valkyrie's guns were of increased range and higher velocity, her

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4-in. guns being of the Mark V. pattern, on C.P. II. mountings, with 30 degrees elevation. In regard to dimensions, the Valkyrie was 15 ft. shorter, over 2 ft. less in beam, and her engines were designed for 27,000 as compared with 36,000 H.P. The consequent saving in weight by having a smaller vessel of lower-powered machinery, coupled with the increased efficiency of geared turbines, enabled a greater speed to be obtained than with the Kempenfelt, although both were designed for 34 knots. At the time of the Valkyrie being ordered, however, there was a demand from the Fleet for a flotilla leader of greater size and displacement, in order to meet the severe weather conditions experienced. The Scott, of 1800 tons (an increase of 480 tons), with a length of 320 ft. as compared with 300 ft., and 2¼ ft. more breadth, was therefore produced to Admiralty design, and at the same time the Shakespeare was ordered from Thornycroft's to their design. In these vessels five 4·7-in. B.L. guns were adopted instead of four 4-in., and a speed of 36½ knots was aimed at. On trial, off the Isle of Wight, the Shakespeare, according to builders' records, made a speed of 38·9 knots with a displacement of 1527 tons, with 348 revolutions and 44,700 H.P.; while the sister ship Spenser, also on the St. Catherine's course, made 37·6 knots with a displacement of 1737 tons, 339 revolutions, and 45,900 H.P.

Mines and depth charges.

Mention has been made of the conversion of the Abdiel for mine-laying, a purpose she fulfilled satisfactorily at the Battle of Jutland, and for which the low visibility, combined with high speed and shallow draught, of such a type of vessel rendered her specially suitable. To permit of the Abdiel carrying eighty mines and sinkers on the upper deck, the two after guns and both pairs of torpedo tubes were removed. Another innovation in the destroyers—affecting all the boats in service—was the provision of depth charges.

Sub-marines.

The building of submarines was another branch of naval construction in which British yards were called upon to execute some important work during the war. A great number of the boats produced were built by Messrs. Vickers, Ltd., who were the pioneers in this direction, and had built all the British submarines in commission when war began, with the exception of the twelve constructed at Chatham Dockyard. The E type, the latest completed in 1914, formed the basis for most of those built during the war, and the number of E class boats was increased from eighteen built and building in August, 1914, to about seventy. E 19, the first of the additions was built, launched, completed, and delivered in eight months; and a group of six boats, including this one, was commissioned within thirteen months from the date of Admiralty instructions to build them. Some boats were built by firms new

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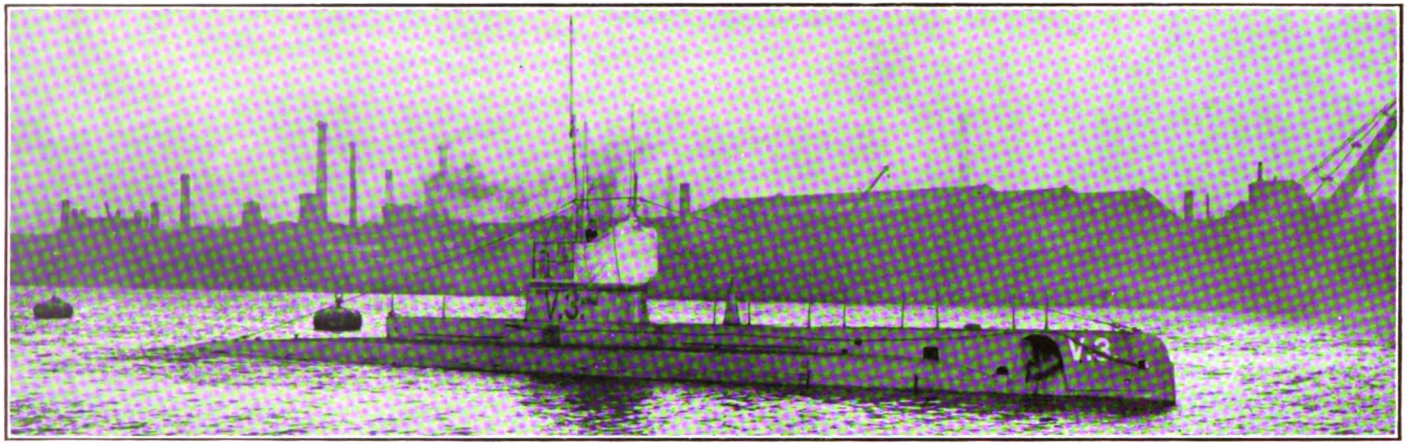
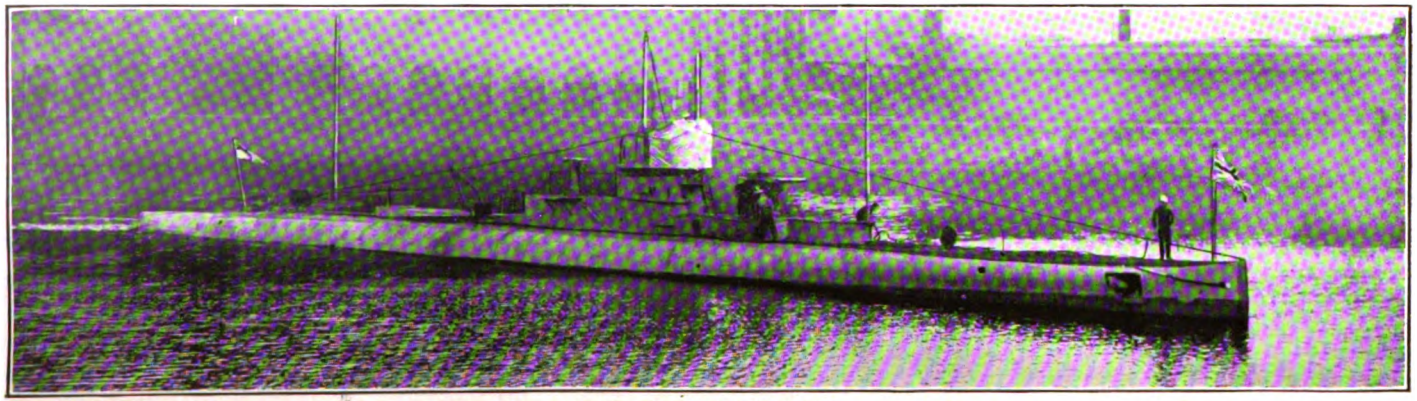


H.M. SUBMARINE V 3.



H.M. SUBMARINE G 8.

(700-950 tons, 1600-840 H.P., 14-10 knots, 4 18-in., and 1 21-in. T.T.)

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to submarine construction, including two by Messrs. Thornycroft, E 33 and E 34. The E class have a length overall of 181 ft., a beam of 22 ft. 7 in. over the side tanks, and a displacement submerged of 780 tons. Five 18-in. torpedo tubes are carried, two in the bow, two on the broadside, and one in the stern; and there is a spare torpedo for each tube. Various types of guns have also been provided. At a cruising speed of ten knots, the radius of action is 3225 nautical miles, with a total oil fuel capacity of 42 tons. There is a surface speed of 15 knots and a submerged speed of 10 knots, and a wireless installation is provided on folding masts, besides under-water signalling apparatus. An interesting development of the periscope is that which enables the observer to examine through it, not only the horizon laterally but also the sky, and so detect enemy aircraft.

V class. Simultaneously with the construction of the E boats, Messrs. Vickers produced a new design, the V class, in which the principal idea was the provision of a complete double hull. This class followed the earlier designs of the firm, of which the V 1 was provided for in the 1912-13 programme, and the V 2—V 4 in that of 1913-14. They were much smaller than the E type, the length overall being 147½ ft., beam of outer hull, 16 ft. 3 in., and submerged displacement 460 tons. A surface speed of 13 knots was obtained from twin sets of Vickers heavy oil-engines, developing 450 B.H.P. each; and when submerged, a normal speed of 8½ knots was obtained from two motors, each developing 190 B.H.P. Each boat was provided with two bow 18-in. tubes, and two spare torpedoes. In the same two programmes as these four V boats, there were four of the W type ordered from Messrs. Armstrong, Whitworth & Co., who had not, until then, undertaken any submarine construction for the British Navy.

F and G classes. The next in order were the F and G classes, designed at the Admiralty. The first of the F class was built at Chatham. In regard to the double-hulled G class, six of this type were built by Messrs. Vickers. The length was 187 ft., beam 22 ft. 8 in., and displacement, when submerged, 840 tons; very similar dimensions, allowing for the extra displacement on account of the double-hull, to the E type. On the surface the speed was 15½ knots, with twin Vickers heavy oil-engines, each developing 800 B.H.P. When submerged, with the motors working at 420 B.H.P. each, the speed was 10 knots. As in the E's, there are five torpedo tubes, but the stern tube is 21 in. instead of 18 in. in diameter. A spare torpedo was provided for each tube. The guns in the G type are two, a 3-in. Q.F. on a disappearing mounting, and a 2 pdr. anti-aircraft gun.

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One of these boats, G 4, sunk the German steamship Ems by gunfire in the Cattegat, on June 19, 1916.

H class. The H class of submarines were interesting as having been built out of Great Britain. They were constructed at the yard of the Canadian branch of Messrs. Vickers at Montreal, which was placed at the disposal of the Admiralty early in the war. Ten submarines. designed by the Electric Boat Company of America, and similar to some of the later U.S. submarines, were built there, and proved their seaworthiness in the voyage across the Atlantic. They proved to be a useful and handy class of small submarines, and were employed in the Adriatic as well as the North Sea. An order for twelve more boats of the H type was placed with Messrs. Vickers in December, 1916, with modifications to allow for a heavier torpedo equipment and a wireless installation of higher power. The length of these boats overall was 171 ft. 9 in., with 15 ft. 9 in. beam, and a submerged displacement of 510 tons. The surface speed was 13 knots, and submerged speed 10 knots. Twin screws were fitted, and the engines developed 480 B.H.P.; while the electric motors had a total normal S.H.P. of 640. The powerful torpedo equipment—for their size—of four 21-in. torpedo tubes was provided in this class, all arranged in the bows, and six torpedoes were carried.

J class. A class of ocean-going submarines known as the J class was begun in the Royal dockyards in 1916. They each had three sets of Diesel engines manufactured by Vickers, and were the fastest heavy oil-engined vessels in the world. These were ocean-going boats suitable for Fleet work, and had a displacement submerged of about 1420 tons. The length was 280 ft., and the armament two guns and six torpedo tubes. The need for submarines of this character was emphasised in Lord Jellicoe's book, in which he showed that at the outbreak of war, whereas the Germans possessed twenty-eight U-boats, of which U 1 to U 4 were hardly fit for oversea work, but were as good as our D class, Great Britain possessed, fit for oversea work, only eight of the D and nine of the E classes, of which D 1 was unreliable, and the remaining units of this type were not equal to the German boats. He also referred to the poor wireless equipment, with a range of only 50 miles, and declared his readiness to sacrifice torpedo armament should this be necessary in order to install efficient wireless apparatus in the only class of vessel which could carry out a watching patrol in the vicinity of the German bases. It was no doubt in response to representations from the Fleet that the J class were constructed, and the first boat was completed at Devonport in May, 1916. In the following month, a regular submarine patrol was begun off the Horn Reef, and eventually

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the British boats engaged in such work were provided with wireless up to a range of 300–400 miles. It may also be mentioned here that it was on June 22, 1916, that the first mines from a British submarine mine-layer were laid by E 41 in the German Bight.

K class. In order further to meet Grand Fleet requirements, a new type of submarine was designed at the Admiralty. These boats could maintain their station with the Fleet when cruising. This was the K class, and a number of them were ordered in the Royal dockyards, from Messrs. Vickers, and later from other firms. These vessels were 339 ft. long overall, with 26 ft. 8 in. beam, and a displacement when submerged of 2570 tons. The double hull principle was embodied in a modified form, and the ends of the boat, which might be damaged without endangering her immediate safety, had only a single hull at the sides. The special feature of the K class was that they were steam-driven on the surface, with funnels so arranged that they could be hinged down when the boat was in diving trim. Steam was obtained from two Yarrow boilers with a working pressure of 235 lb. per sq. in. The engines were twin sets of geared steam turbines, which developed S.H.P. of 10,500, giving a speed of 24 knots, or from 7 to 10 knots more than previous types of British submarines propelled by oil-engines. The periscopes provided for the K class were the longest which at that time had been made for British submarines, having a length of 30 ft. from eye-piece to head-piece. Each boat was armed with two 4-in. guns and one 3-in. anti-aircraft gun, while there were also four bow and four broadside 18-in. torpedo tubes.

L class. The L class embodied the experience of earlier oil-engined boats. Their length was 238 ft. 6 in.; beam over side tanks, 23 ft. 6 in.; and total submerged displacement, 1090 tons. More powerful Diesel engines gave increased speed. The twin screws, worked by four-cycle 12-cylinder oil-engines, developed a total of 2600 B.H.P., giving a surface speed of 17 knots. For submerged running motors of 1600 H.P. gave 10½ knots. The L class are fitted with four 21-in. tubes in the bows, and two 18-in. tubes in the broadside room, with a spare torpedo for each tube. A 4-in. gun was also carried, with which large angles of training were possible by means of a revolving platform which moved with the gun. These submarines, in addition to the ordinary instruments common to such vessels, were provided with a night periscope.

R class. Mention must also be made of the small coastal submarines of the R type, of which twenty-four were built, of a fast, handy design suitable for attacking enemy submarines. An experiment was also

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made with a "submarine monitor," and the M1 was provided with one 12-in. gun.

Special types.

There remain to be described briefly the various types of vessels, auxiliary and otherwise, which under the experience of war were developed to meet the needs of the Navy. Added to these were the novel classes, the designs of which Lord Fisher, as Mr. Churchill stated in 1915, brought with him to the Admiralty in October, 1914, in order to carry out certain strategical plans which he had in view. Everything ordered at this time was in furtherance of his policy of aggressive measures against the enemy. The big light-draught cruisers have already been mentioned. Among other types were the monitors, sloops and mine-sweepers, patrol gunboats, whalers, trawlers, and several classes of fleet oilers, as well as coastal motor-boats and launches, and the Insect classes of gunboat which were largely used in Mesopotamia.

Monitors.

As regards the monitors, it was charged against them at the time of their construction that they had a limited fighting value, but as a matter of fact they proved to be of material usefulness for the purpose for which they were built. Whether on the Belgian coast, or in Gallipoli, against the Königsberg in the Rufigi River, or along the Italian littoral, they did good service in the amphibious operations. The blisters or bulges on the hulls of these vessels—and also on others, including older types of cruisers like the Edgar class—defied mines and torpedoes, and the heavy guns mounted enabled them to cope with the fire of enemy artillery.

Severn class.

The first monitors used by the British Navy in the war were the ex-Brazilian ships building at Vickers, which were taken over at the declaration of hostilities. These vessels, of 1260 tons, and armed with three 6-in. and two 4·7-in. guns, would be better described as river gunboats. The draught was only 5 ft. 8 in., and all three, Severn, Mersey, and Humber, did useful work off the Belgian coast before being transferred to the Dardanelles. The two first-named also destroyed the Königsberg in July, 1915.

Abercrombie class.

The work of this trio showed the need for larger and more powerfully armed vessels of a similar shallow-draught design, and four 14-in. gun monitors were begun in November, 1914. The first ship, the Abercrombie, was launched within four months and completed within six. She had a pair of 14-in. guns in a single revolving turret worked electrically, both guns and turrets being obtained from America as was also the barbette armour, which was 8-in. thick above the upper deck and 2-in. below and down to the main deck. Originally only two 12-pdrs. were carried as secondary armament, but enemy torpedo craft activity led to two or four 6-in. guns being provided on the forecastle deck.

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Following, within a month, the 14-in. monitors came eight designed for a pair of 12-in. guns each. The weapons were obtained from the Majestic battleships, and were thus of very old type, worked by hydraulic power with fixed loading position; they were soon outranged by the German batteries on the Belgian coast. Three of these ships were ready in July, 1915, and the rest between that month and November. Like their 14-in. predecessors, they were propelled by steam-driven reciprocating engines—an illustration of the make-shift character of their construction, in which everything was subordinated to the determination to have complete a floating gun platform at the earliest possible date. Equally typical of this was the decision in regard to the next monitors—the Marshal Ney and Marshal Soult. To expedite the delivery of these 15-in. gun monitors, ordered in January, 1915, it was arranged to instal in them twin sets of internal combustion engines, which had been designed to propel two oil carriers; this expedited their delivery. The 15-in. guns were diverted from battleships under construction. The Marshal Ney was modified later, and her armament was reduced, first to one 9·2-in. and four 6-in. guns, and later to six 6-in. and three 3-in. anti-aircraft guns. She was moored in the Downs as a guardship. Her 15-in. guns were transferred to a new and faster monitor—the Terror—which, with the Erebus, was ordered in September, 1915. They had a speed of 12 knots as compared with the 7 to 8 knots of earlier ships. The Erebus and Terror were the only large monitors actually struck by torpedoes in 1917, an attack which they withstood successfully. Fourteen 9·2-in. monitors—M 15 to M 28, and five 6-in. monitors, M 29 to M 33, were also built in 1915, with guns taken from the Powerful and other ships. The 6-in. monitors, of 580 tons, were completed within three months. 14-in. and 15-in. monitors.

Before the war no vessels had been specially built for use as mine-sweepers, although certain classes, such as the Skipjack type of torpedo gunboat, had been improvised. The need for additional units for mine-sweeping, even after the large number of steamers had been taken up, led to an order being given on January 1, 1915, for twelve single-screw sloops, which would also be available for general service with the Fleet, such as transport of liberty men, towing duties, and the like. They were named after flowers, and became popularly known as the "herbaceous border" class, while the number built grew to a total of 118 vessels. At first, an armament of two 12-pdrs. was fitted, with two 3-pdr. anti-aircraft guns and two depth charges, but later two 4·7-in. or 4-in. guns were adopted in some, while in others one of the 12-pdrs. was exchanged for a 4-in. weapon. One interesting feature was that the magazine, protected by 1½-in. H.T. Sloops.

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steel, was placed so far aft that often ships were saved after being torpedoed when they would otherwise have been destroyed by the ammunition blowing up. The magazine was sometimes thrown bodily into the air without detonating the charges. Some seven of the sloops were used as Q boats, with a certain amount of success, but the amount of general work performed was immense. A liner was convoyed on one occasion for 400 miles at 17 knots, and a monitor was towed from England to Mudros without any trouble. Another sloop had steam up for 125 days without a break, and another spent twenty-six days at sea. The class, as a whole, earned a high reputation for seaworthiness. Twelve of them came through a violent hurricane without any structural damage.

Mine-sweepers.

A flotilla of thirty-two paddle mine-sweepers was ordered at various dates between September, 1915, and January, 1917, in response to reports from sea that paddle vessels were more efficient than trawlers. They were given racing names, such as Ascot, and were designed for a sea speed of 15 knots (with a sweeping speed of about 12 knots); to be able to keep at sea for one week, with a draught not to exceed 7 ft., and a maximum displacement of 850 tons. Early in 1916, however, after experience with the paddle vessels, there was a reversion to twin-screw mine-sweepers, as being more efficient in bad weather, and free from the danger of mines getting under the paddles. Twenty boats were built, of 730 tons displacement, at an average cost of £65,000, all named after hunts. After it was found that the first ship, the Muskerry, proved satisfactory, fifty-six more vessels of slightly larger dimensions were ordered, these being of 800 tons displacement, with 2200 H.P., as compared with 1800. In addition to the sweeping gear fitted to the earlier vessels, an additional paravane sweep was fitted to the Muskerry, the paravanes being stowed as far aft as possible, and lifted in and out by Quixo davits; proving satisfactory, the appliance was applied to all the vessels.

Patrol boats.

Another new type, produced in reply to a need for more vessels of the destroyer type for use in submarine-hunting, escort work, etc., was that of the patrol boat. In the spring of 1915, the construction of destroyers fully occupied the firms accustomed to naval work, and the new design of a fast craft, with low visibility, moderate speed, and a good armament for defensive purposes, coupled with quick manœuvring qualities, was therefore entrusted to merchant firms. Orders were given for twenty-four vessels, and subsequently for a further thirty. The machinery, geared turbines, was designed for 3800 S.H.P., ratio 10 to 1, with a full speed of 20 knots, there being two water-tube oil-fired boilers. On trial, with 4000 S.H.P.,

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22 knots was obtained. A development of the patrol-boat design was made at the end of 1916 in anticipation of the German unrestricted submarine warfare, when ten existing boats were adapted as decoy ships. They were at first termed P Q-boats, but to avoid confusion with the Q-boats proper they were afterwards known as P C-boats. In January, 1917, six new P C-boats, numbered 65 to 70, were ordered, and four more in June, 1917, 71 to 74. The equipment of the class was modified from time to time to keep pace with the changing conditions of anti-submarine work, in which they proved very successful. Several of the boats were used to tow kite-balloons for observation purposes.

Whalers, trawlers, and C.M.B.'s.

Of the remaining classes of miscellaneous auxiliary craft built for the Navy during the war it is unnecessary to do more than mention the Admiralty whalers and trawlers, while the provision of a fleet of oilers was chiefly important from the standpoint of supply, although it had a direct connection, of course, with the fighting efficiency of the Fleet. There remain the coastal motor-boats, which were remarkable and novel vessels. The use of these "scooters," as they were sometimes called, for war purposes was not entirely without precedent, for a 40-ft. motor torpedo boat was built in England for the Russian Navy at the time of the war with Japan. They were practically a development of the racing motor-boats, which were a familiar spectacle in the Solent and elsewhere before the war. In January, 1916, following trials of the boat by the torpedo specialist in the Vernon, it was decided that there was every chance of a torpedo being discharged from such a craft when going over 30 knots. and twelve coastal motor-boats were ordered from Messrs. Thornycroft by Sir Henry Jackson. The first three were completed in April, and by the end of 1916 sufficient experience had been obtained to justify four boats being sent to Dunkirk for duty in connection with aircraft raids on the Belgian Coast, where they had some success. The crew consisted of two officers only. A novel feature was that the torpedo was discharged tail first over the stern, the motor-boat then using her high speed and manœuvring powers to steer clear of its track. Meantime, a larger type, 55 ft. long instead of 40 ft., was designed for anti-submarine work, armed with four depth charges as well as a torpedo. Arrangements were made with Messrs. Thornycroft and about a dozen other firms for the production of a large number of these boats. Besides the two officers these 55-ft. boats had two motor mechanics and a wireless operator. A still later design provided for a 70-ft. boat. With speeds well over 40 knots, the C.M.B.'s moved on the water rather than through it, their bows pointing high in the air, thus reducing the resistance, and the taffrail

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deep down in a smother of spray. In addition to anti-submarine work and other duties with the Fleet—certain warships taking them to sea hanging from davits—the part played by these craft in the blocking of Ostend and Zeebrugge is described in Admiral Keyes' despatch.

Motor launches.

The provision of a mosquito fleet of motor launches was another creditable achievement which gave good results, and came especially into prominence at the time of the operations at Zeebrugge. In April, 1915, a contract for fifty of these craft was signed with the Elco Company, of Bayonne, New Jersey, a firm which had not previously built perhaps more than a dozen yachts and twenty or thirty smaller craft, but which, by scientific standardisation of parts, completed this order early in 1916. A supplementary order was given to this firm after the Lusitania was sunk. Assembled at Montreal and Quebec, the boats were transported by rail to Halifax, and after being tested there, were shipped to England, 130 transports being required in all to bring them across, with their equipment.

In all, over 600 motor launches were ordered, and 580 were shown by the official "Navy List" to have been commissioned. Most of them varied from 75 ft. to 80 ft. in length, and were propelled by two sets of 220-H.P. six-cylinder gasolene engines. The speed was 19 knots, although 20 knots was obtained on trial, while the radius of action was 750 nautical miles at full speed and 1000 at 15 knots. The gross tonnage of the 75-ft. boats was 39 tons, and of the 80-ft. boats 46 tons. There is accommodation for ten men.

Tigris gunboats.

The special conditions of the expedition in Mesopotamia led to the provision of a fleet of gunboats armed with one 4-in. gun and one 12-pdr. gun each, for duty on the Tigris, and the construction of the twelve vessels of the Fly class, with names all terminating in the word "fly," was a very creditable achievement on the part of Messrs. Yarrow and Co., who were given a free hand for the work in February, 1915. The length of the boats was 120 ft., with 20 ft. beam, and a draught of 2 to 2½ ft., the last-named being so small that when the river overflowed its banks it was possible to save time by cutting off the bends, and the Arab pilots often indicated the course over the shallows by walking in the water ahead of the vessel. A single-screw was adopted, and the screw-in-tunnel, with Yarrow's patent hinged flap, was the mode of propulsion selected. With 175 H.P. the designed speed was 10 knots. Within six months from the date of order the boats were finished ready for shipment to the Tigris, where operations were begun on August 24, 1915, and the keel of the Firefly was laid at Abadan. This vessel, completed in November, was the only one of the class in the first expedition under

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General Townshend, and was captured by the Turks, but retaken later on during the operations which resulted in the capture of Bagdad. The last gunboat of the first twelve was commissioned on March 11, 1916. After the capture of the Firefly, four more of the class, increasing the total to sixteen, were ordered.

China gunboats.

Four large river gunboats, the Mantis, Moth, Tarantula, and Gnat, were 230 ft. long, by 36 ft. beam, with 4 ft. draught, propelled by twin screws. These went out from England under their own steam. Different firms, working from Yarrow designs, constructed these boats. In the later phases of the Tigris fighting they proved invaluable. They were of the same type as eight others, all named after insects, which were built for service in China. With 2000 H.P., the class were designed for 14 knots, and had an armament of two 6-in., two 12-pdrs., and six machine guns. It may be mentioned here also that some motor hospital ships were also built in England for the Mesopotamia expedition, designed by Sir J. H. Biles and Co., Naval Architects to the India Office. On a draught of 3 ft. 6 in., the length of these vessels was 160 ft., between the perpendiculars, the breadth moulded 6 ft., and the height to the sun deck at the centre 28 ft. They were propelled by two Thornycroft paraffin motors of 150 B.H.P. each, the speed being 8 knots.

The above survey of the work accomplished in the expansion of the Fleet, necessarily condensed as it is, will serve to show with what foresight and courage the successive Boards of Admiralty tackled the subject of providing for the varying needs of the Fleets, as these were notified from time to time by the Commanders-in-Chief. Nothing could have excelled the promptitude and ingenuity with which the Chief Constructor of the Navy and his staff produced plans of vessels designed to carry out the wishes of the Board, while the successful manner in which firms (many of them new to Admiralty contracts) coped with the production of ships, engines, and all kinds of equipment required for craft of widely divergent and novel types, constitutes a dramatic revelation of the resources which lay hidden in the shipyards and industrial establishments of the country. Although people are said to be getting a trifle dazed with statistics of big achievements in the war, those best able to judge will appreciate the significance of the statement of Sir Eustace d'Eyncourt in his lecture to the Institution of Naval Architects on April 9, 1919, that during the war some 2,000,000 tons were added to the Navy, at a cost probably between £250,000,000 and £300,000,000 sterling. Reference to the Navy Estimates shows that the aggregate sum spent during the four years before the war on new construction amounted to approximately £60,000,000.

CHAS. N. ROBINSON.

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CHAPTER IX.

ADMINISTRATION AND *PERSONNEL.*

I.—ADMINISTRATION.

THE BOARD OF ADMIRALTY DURING THE WAR.

FIRST LORDS.

Rt. Hon. Winston L. S. Churchill, M.P.	*October* 24, 1911
Rt. Hon. Arthur J. Balfour, M.P.	*May* 28, 1915
Rt. Hon. Sir Edward Carson, M.P.	*December* 15, 1916
Rt. Hon. Sir Eric C. Geddes, K.C.B., M.P.	*September* 6, 1917
Rt. Hon. Walter Long, M.P.	*January* 16, 1919

FIRST SEA LORDS.

Admiral Prince Louis of Battenberg, K.C.B. (Marquis of Milford Haven)	*December* 9, 1912
Admiral of the Fleet Lord Fisher, G.C.B., O.M.	*October* 30, 1914
Admiral Sir Henry B. Jackson, K.C.B., K.C.V.O.	*May* 28, 1915
Admiral Sir John R. Jellicoe, G.C.B. (and Chief of the Naval Staff)	*December* 4, 1916
Admiral Sir Rosslyn E. Wemyss, K.C.B., C.M.G. (and Chief of the Naval Staff)	*January* 10, 1918

DEPUTY FIRST SEA LORDS.

Vice-Admiral Sir Rosslyn E. Wemyss, K.C.B.	*September* 6, 1917
Rear-Admiral G. W. P. Hope, C.B.	*January* 10, 1918

DEPUTY CHIEFS OF THE NAVAL STAFF.

Vice-Admiral Sir Henry Oliver, K.C.B.	*May* 31, 1917
Rear-Admiral and Vice-Admiral S. R. Fremantle, C.B.	*January* 10, 1918

ASSISTANT CHIEF OF THE NAVAL STAFF.

Rear-Admiral and Vice-Admiral Sir Alexander L. Duff, K.C.B.	*May* 31, 1917

SECOND SEA LORDS.

Vice-Admiral Sir John R. Jellicoe, K.C.B.	*December* 9, 1912
Vice-Admiral Sir Frederick T. Hamilton, K.C.B.	*August* 6, 1914
Vice-Admiral Sir Cecil Burney, K.C.B.	*December* 4, 1916
Vice-Admiral Sir Herbert L. Heath, K.C.B. (and Chief of Naval *Personnel*)	*September* 27, 1917

THIRD SEA LORDS AND CONTROLLERS.

Rear-Admiral A. G. H. W. Moore, C.V.O.	*May* 29, 1912
Rear-Admiral E. C. T. Tudor, C.B.	*September* 1, 1914

THIRD SEA LORD.

Rear-Admiral Lionel Halsey, C.B., C.M.G.	*May* 31, 1917 (*until June* 16, 1918)

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CONTROLLERS.

Vice-Admiral (*temporary*) Sir Eric C. Geddes	*May* 31, 1917
Sir Alan G. Anderson, K.B.E.	*September* 6, 1917

THIRD SEA LORD AND CONTROLLER.

Commodore and Rear-Admiral C. M. de Bartolomé, C.B.	*June* 17, 1918

FOURTH SEA LORDS.

Captain Cecil F. Lambert, R.N.	*December* 1, 1913
Captain and Commodore Lionel Halsey, C.B., C.M.G.	*December* 4, 1916
Rear-Admiral Sir H. H. P. Tothill, K.C.B. (and Chief of Supplies and Transport)	*May* 31, 1917

FIFTH SEA LORD.

(And Chief of the Naval Air Service).

Commodore Godfrey M. Paine	*January* 31, 1917
	(*Transferred to Air Board, January*, 1918)

CIVIL LORDS.

Rt. Hon. George Lambert, M.P.	*January* 19, 1912
The Duke of Devonshire	*June* 4, 1915
The Earl of Lytton	*August* 31, 1916
Rt. Hon. E. G. Pretyman, M.P.	*December* 12, 1916
The Earl of Lytton	*January* 30, 1919

ADDITIONAL CIVIL LORD.

Sir F. J. S. Hopwood, G.C.M.G., K.C.B.	*January* 19, 1912
	(*Post terminated June*, 1917)

SECOND CIVIL LORD.

Mr. A. F. Pease	*January* 10, 1918

THIRD CIVIL LORD.

Sir R. S. Horne	*June* 17, 1918
	(*Post terminated January*, 1919)

FOURTH CIVIL LORD.

The Earl of Lytton	*December* 28, 1918
	(*Post terminated January*, 1919)

PARLIAMENTARY AND FINANCIAL SECRETARY.

Rt. Hon. T. Macnamara, LL.D., M.P.	*October* 2, 1911

PERMANENT SECRETARIES.

Sir W. Graham Greene, K.C.B.	*October* 2, 1911
Sir Oswyn A. R. Murray, K.C.B.	*August* 7, 1917

THE most marked feature in the organisation and administration of the Admiralty during the four years of the war was the progressive and definite separation of staff duties—those concerned with operations—from duties which are purely administrative, being duties connected with the up-keep and maintenance of the Navy. The system was developed to meet more directly the exigencies of the war. It is not too much to say that this reorganisation, which was completed in 1917 when Sir Eric Geddes was First Lord,

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carried the Admiralty very far along the road towards the former arrangement, as represented by the Admiralty Board, the Navy Board, and the Boards of Victualling and Transport. Under the First Sea Lord and Chief of the Naval Staff were grouped the duties which appertained to the old Board of Admiralty, and under the other Sea Lords and the Civil Lord those which were executed by the former subsidiary Boards. An exception certainly arises in the case of the Second Sea Lord, who is Chief of the *Personnel*, because, under the former administration of the Navy, there was no Manning Board, though the institution of one was suggested to Lord St. Vincent.

The Naval Staff and administrative duties.

Broadly speaking, the object of the changes of 1917 was, on the one hand to free the First Sea Lord and the heads of the Naval Staff as far as possible from the conduct of administrative work, and on the other, to strengthen the shipbuilding and productive departments of the Admiralty in order to fit them better for the conduct of the colossal and complicated business of the war. On the latter side of its responsibilities the Board was furnished with an organisation comparable to that which supplied the Army with its munitions, occupied in duties relating to shipbuilding, armaments, and munition supplies.

The reorganisation of the duties of the First Sea Lord, and an enlargement of the Naval Staff, had become necessary. Staff work, under other descriptions, had always been conducted at the Admiralty. In former times, when the First Lord was a seaman, like Anson, St. Vincent or Barham, he would decide upon plans of operations, not upon every occasion in association with his naval colleagues, and if he was not a seaman, the naval colleagues of the First Lord were not always able to dictate the course of operations. When Sir Cooper Key was First Sea Lord the idea of what is known as a "thinking department" took shape. A Foreign Intelligence Committee, under the direction of Captain W. H. Hall, was instituted, and contained the germ of a Naval Staff. In 1887 it was expanded into a Naval Intelligence Department, and it included in its functions the duty of "the framing of plans for naval campaigns suitable for each station in the event of war with any given Power." Practically all, or nearly all, the elements of a War Staff existed at the Admiralty in the Intelligence and Mobilisation Departments prior to the re-organisation of 1912, but a further development was imperatively required.

At the outbreak of war the duties of the First Sea Lord, then the present Marquis of Milford Haven, and of the War or Naval Staff were conducted according to the provisions of the Memorandum of the First

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Lord, Mr. Winston Churchill, dated January 1, 1912. The Chief of the War Staff, Admiral Sir Doveton Sturdee, who had just succeeded Admiral Sir Henry Jackson, directed the three Divisions of Intelligence (war information), Operations (war plans), and Mobilisation (war preparation and arrangements). The First Sea Lord was not then himself Chief of the Staff. The Chief of the Staff at that time was "primarily responsible" to him, and was the link or channel between him and the Staff Divisions. A feature of the arrangement, which has since disappeared, was that the First Lord could consult the Chief of the Staff independently of the First Sea Lord.

Officers from the Grand Fleet brought to the Admiralty.

It was after Lord Jellicoe, from his great command of the Grand Fleet, had returned to the Admiralty as First Sea Lord in December 1916, bringing with him to the Admiralty departments officers fresh from experience at sea, that these very important changes were made. The Admiral's own staff in the Grand Fleet had been organised on the lines subsequently developed at the Admiralty, the operational side under the Chief of the Staff, and the material side under the Captain of the Fleet, though, on going to sea, the latter officer naturally went over to the operational side. From early in the war the Board had been fully alive to the danger of insufficient organisation at the Admiralty, especially for the creating of means for dealing with enemy submarines. A Submarine Attack Committee, under Captain L. A. B. Donaldson, had rendered very valuable service, but, when Lord Jellicoe came to the Admiralty, the then existing organisation was developed into the Anti-Submarine Division of the Naval Staff. A senior officer, Rear-Admiral Alexander L. Duff, with clever young officers as his staff, was to develop means and to see to the production of material resources necessary for dealing with the enemy's submarines.

First Sea Lord's duties re-organised.

Under the new organisation, announced on May 14, 1917, the former Chief of the Admiralty War Staff disappeared, and Sir John Jellicoe, as the gallant officer then was, became Chief of the Naval Staff as well as First Sea Lord. Thus a semi-independent Chief of the Staff no longer existed for consultation with the First Lord. The procedure of strengthening the Naval Staff by the addition of officers transferred from active sea service was continued. The Admiralty Board was enlarged by the addition of naval members. Sir Henry Oliver, from being Chief of the War Staff, became Deputy Chief of the Naval Staff and an additional member of the Board. At the same time Rear-Admiral Duff was replaced in the charge of the Anti-Submarine Division, and became an additional member of the Admiralty Board, with the duties and title of Assistant Chief of the Naval Staff. Thus the operational side of the Board was very greatly

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strengthened, and better provision was made for the execution of the enormous responsibilities of the First Sea Lord, which covered twenty-four hours of the day.

Sir Eric Geddes as Controller.

A remarkable feature of this reorganisation, on the "maintenance" side, was the inclusion in the Board, as an additional member, with the title of Controller, of Sir Eric Geddes, to whom was given the honorary and temporary rank of Vice-Admiral. The object of this development was thus explained: "It is intended to develop and utilise to the best advantage the whole of the shipbuilding resources of the country, and so far as possible, to concentrate the organisation under one authority. Sir Eric Geddes has been chosen for this position, and he will be responsible for fulfilling the shipbuilding requirements of the Admiralty, War Office, and Ministry of Shipping, so far as possible, by manufacture or purchase, whether at home or abroad. For this purpose the staffs of the three departments that relate to these requirements will be placed under his control. As the duties for which Sir Eric Geddes will be responsible at the Admiralty will include not only shipbuilding, but also the production of armaments and munitions, it is necessary that his touch with the Admiralty should be close and intimate, and for this reason he has been appointed a member of the Board of Admiralty. He will also be associated with the Ministry of Shipping as a member of the Shipping Control Committee."

Naval and mercantile supplies.

As far as possible a distinction was set up between naval and mercantile shipbuilding. The Department of the Controller of the Navy was divided into three branches:—

(*a*) The Deputy Controller of Dockyards and Shipbuilding provided ships for the Navy;

(*b*) The Deputy Controller of Armament Production provided guns, torpedoes, mines, explosives, and generally the armament required for the Navy; and

(*c*) The Deputy Controller of Auxiliary Shipbuilding provided all mercantile tonnage, together with such auxiliary and miscellaneous craft as mine-sweepers, trawlers, oilers, and generally the vessels required for commerce and for other uses not included in the Department of the Deputy Controller of Dockyards and Shipbuilding.

Sir Alan Anderson succeeded Sir Eric Geddes as Controller in September, 1917.

An important further step in Admiralty reorganisation took shape in October, 1917, at which time Vice-Admiral Sir Rosslyn Wemyss, subsequently First Sea Lord, had become Deputy First Sea Lord, while Sir Francis Hopwood had left the Board in June

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owing to his duties as Secretary of the Irish Convention, his functions, as Additional Civil Lord, being otherwise provided for. The members of the Board continued to deal individually with the duties allotted to them, but were then grouped in two recognised Committees, corresponding with the separation of staff duties from those connected with supply and maintenance. This was a development of the very highest importance. The Board was divided into two separate sections, each with well-defined duties, but without making any breach in the unity of the Board. The principle of isolating the work of planning and directing naval war operations from all other work, in order that it might receive the entire attention of officers selected for its performance, was applied systematically to the constitution of the Board.

Operations Committee of the Board.

The Operations Committee consisted of the First Lord as ex-officio chairman, the First Sea Lord and Chief of the Naval Staff, the Deputy First Sea Lord, the Deputy Chief of the Naval Staff, the Assistant Chief of the Naval Staff, and the Fifth Sea Lord and Chief of the Naval Air Service as necessary. The functions of the last-named officer ceased when the Royal Naval Air Service was merged in the Royal Air Force. The duties of the Operations Committee were to deal with questions of naval strategy and subjects connected with the provision, equipment, efficiency, organisation, and employment of the Navy as a fighting force. Under Order in Council (October 23, 1917) the First Sea Lord was made responsible to the First Lord for the issue of orders to the Fleet affecting war operations and the movements of ships, which orders might be issued in his own name in his capacity as Chief of the Naval Staff. This was a very important and significant decision. It touched the whole question of Fleet command and final responsibility, and is further referred to below.

Maintenance Committee.

The Maintenance Committee consisted of the First Lord as ex-officio chairman, the Deputy First Sea Lord (representing the Operations Committee), the Second Sea Lord, to whom was given the title of Chief of Naval *Personnel*, the Third Sea Lord, who was then called Chief of Naval *Matériel*, the Fourth Sea Lord, with the title of Chief of Supplies and Transport, the Civil Lord, the Controller (whose position as an individual member has since disappeared, being merged with that of the Third Sea Lord), the Financial Secretary, and the then Fifth Sea Lord and Chief of the Naval Air Service. The Maintenance Committee's duties were to deal with questions affecting the provision of *personnel*, the *matériel* of the Navy, and important supplies, the erection of works, and other subjects connected with the maintenance of the Navy in a state of efficiency.

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The provision of officers and the manning of the Fleet has naturally thrown a great responsibility upon the Second Sea Lord during the war. Every day the question of the *personnel* increases in importance.

The institution of these two most important Admiralty Committees, constituted from among the members of the Board, did not imply any rigid separation. On the contrary, there was to be no exclusion of any member of one committee from the other, and matters of high importance were referred to the whole Board.

Disappearance of the Royal Naval Air Service.

Here it may be remarked, as a point of considerable organic and administrative importance, that the disappearance of the Royal Naval Air Service in March, 1918, has resulted in a position that is anomalous. The work, *e.g.*, of patrolling by airships, seaplanes, and flying-boats, is purely naval, and the Navy cannot remain permanently without its own air service, comprising every necessary kind of craft whether heavier or lighter than the air. It is not without significance that, in the re-distribution following the dispersal of the Grand Fleet, Rear-Admiral Sir Richard Phillimore was appointed "Admiral Commanding Aircraft and Rear-Admiral Commanding the Flying Squadron, Atlantic Fleet."

The Naval Staff enlarged—Director of Plans and Training.

Recurring to the Naval Staff, certain very important changes which took shape in the great reorganisation of October, 1917, must be noted. One was the institution of a Director of Plans, whose duty was to deal with the consideration and preparation of strategic plans, and questions of naval policy for the Operations Committee, as well as matters relating to the use of new weapons and material, and the requirements of bases. A Director of Training was also added to the Naval Staff, it being recognised that training was a true function of staff work. This new officer was concerned with the principles of the training of officers, men and boys, complements and establishments, and the compilation of manuals and text-books. Consequent upon these changes the Mobilisation Division ceased to form part of the Naval Staff, being transferred to the Second Sea Lord, Chief of the *Personnel*. Those duties of the Mobilisation Division which concerned the supply of fuel, etc., to the Fleet, came under the Director of Operations. The Directors of Naval Intelligence and of Training and Staff Duties worked directly under the First Sea Lord. The other Divisions of the Naval Staff were those of the Directors of Operations, of Plans, and of Signals, under the Deputy Chief of the Naval Staff; of Trade (concerned with arming merchant ships, training of the Mercantile Marine, trade questions, blockade policy, etc.), of Mine-Sweeping and of Anti-Submarine services (auxiliary patrols, anti-submarine measures, special service ships, etc.), under the Assistant Chief of the Naval Staff; and of Operations (Foreign),

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under the Deputy First Sea Lord. Here it may be noted that when the auxiliary patrol was started in August, 1914, it was developed under the Fourth Sea Lord, but the patrol was worked under the Director of Operations, being afterwards merged in the duties of the Director of the Anti-Submarine Division.

Naval Intelligence Division.

Very important changes had already taken place in the Intelligence Division. No longer concerned merely with Intelligence generally, it was now charged with the vital business of Intelligence as it affected naval operations. Rear-Admiral Sir Henry Oliver, who had rendered valuable service, was succeeded by Rear-Admiral Sir Reginald Hall as Director of Naval Intelligence, and developments of the utmost importance followed. Probably no greater compliment was ever paid to a department of the Admiralty than that of the German officers, who declared that every movement of their Fleet became rapidly known to the Intelligence Division. It was, indeed, the persistent and ubiquitous knowledge gained by the British Navy and centred in the Intelligence Division that was chiefly instrumental in paralysing the initiative of the German Fleet and thus bringing about its surrender. The methods by which this intelligence was obtained cannot be described here. They were many and various, and those employed by the flying officers of the Royal Naval Air Service were not the least important of them. The most striking feature in the expansion of the Intelligence Division was the introduction of civil ability, with the object of gaining the help of experts of all kinds. Men of science and letters, eminent scholars, lawyers and linguists, and travellers acquainted with all countries, were brought into the Service. This was, perhaps, the boldest and most successful thing done by Admiral Hall. A large geographical section formed part of this development. The Division produced numerous authoritative reports and volumes on many countries of the world and on many theatres of the war.

Staff duties.

When Sir Eric Geddes succeeded Sir Edward Carson as First Lord other very important changes were made at the Admiralty. Attention was directed to the development of scientific experiment and research, to which reference will be made below. Some changes were afterwards made in the distribution of business (June, 1918), and the duties were defined of the Deputy Chief of the Naval Staff, who is concerned, *inter alia*, with all operations and movements of ships and co-operating aircraft in Home waters, and of the Deputy First Sea Lord, who deals with general questions of naval policy not connected with operations in Home waters, and with questions relating to foreign stations and cruiser operations. The Third Sea Lord and Controller exercised duties naturally affected

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by the war in many directions, as in the order of priority of work and the selection of vessels for service as armed merchant cruisers, according to the requirements of the Chief of the Naval Staff. The Civil Lord assumed larger administrative duties; and urgent work conducted by the Works Department was placed under direction of Colonel Sir Alexander Gibb, K.B.E., with the title of Civil Engineer-in-Chief.

Ultimate responsibility.

A matter of paramount importance was better defined, having reference to the responsibility for orders issued to the Fleet. The Order in Council of October 23, 1917, as is noted above, had said: "The First Sea Lord as Chief of the Naval Staff is responsible to the First Lord for the issue of orders to the Fleet affecting war operations and the movements of ships, which orders may be issued in his own name as Chief of the Naval Staff." It was now (June 17, 1918) laid down that the responsibility for these orders did not lie with the Board, unless the questions had been referred to the Board. Unless operation orders resulted from Board decision, the responsibility of issuing them remained, under Order in Council, "on the shoulders of the Chief of the Naval Staff, and of the First Lord." It was, however, intended that important matters should be brought before the full Board whenever circumstances would admit of this being done, and with this object the business of the Board was regulated afresh. The Operations Committee, dealing with questions of naval strategy, operational policy and related matters, was to refer questions of great importance within its sphere to the First Lord, with a view to their being brought before the whole Board. It was indicated that the object of the weekly Board meetings was to ensure, as far as possible, that not only large questions of Admiralty policy—most of which would reach the Board by way of the Operations and Maintenance Committees—but also all matters of general interest, especially those having an important bearing on the traditions, privileges, and well-being of the naval service, should come before the Board as a whole.

Coast naval bases.

At this point reference must be made to a very important part of the war system, which demanded great powers of organisation and administration. The coastal waters of the British Isles were divided into areas, and on all the coasts specially organised naval bases were developed or created, each adapted for its duties, but largely concerned with mine-sweeping and coast patrol. Langhope on Scapa Flow, Rosyth and Dover were Fleet Bases. Kirkwall was the great base for the Blockade Examination Service, and Ramsgate and Falmouth conducted like work. A number of bases, including Granton, the Tyne and Portland, were concerned with mine-sweeping, patrol work,

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anti-submarine operations, and aircraft. Invergordon was a base for mine-sweeping and repair work. The Clyde, Lerwick, Inverness, Immingham, Yarmouth, Lowestoft, Queenstown, Buncrana, and Larne were all notable bases, some of them concerned with convoy organisation and despatch, issuing route instructions, and other duties. The submarine and mine-sweeping bases were of the highest importance. The command of the auxiliary patrol flotillas lay with the Senior Naval Officers of the areas, and the general administration of the Service with the Auxiliary Patrol Officer at the Admiralty. It is impossible to over-rate the value of the organising and administrative work of the zealous officers who were engaged at the bases throughout the war.

Administration of coast bases.

It will be realised that the operations of bases engaged in the working of vessels in many forms of duty, and with intelligence, operations, repair and maintenance, must have required staff work of a high order at the bases, and of constant direction and supervision at the Admiralty. Many of the bases began in a small way, and developed, contracted or changed to meet growing and changing conditions. Each of the larger bases had its Operative and Administrative Staffs on the system adopted at the Admiralty, interdependent one with the other, and each engaged in its special duties. The system worked extremely well. How efficiently and zealously all this service has been executed cannot be described here. The Admiralty had a great work and responsibility in the conduct and direction of these coast organisations, which played a very important, though not fully recognised, part in the operations of the war at sea.

Board of Invention and Research.

In January, 1918, on the initiative of Sir Eric Geddes, then First Lord, an extension was made of the Admiralty organisation for the prosecution of scientific research and experiment. The Board of Invention and Research, under the presidency of Lord Fisher, had been brought into being by Mr. Balfour in July, 1915, and had rendered invaluable service. Sir Charles Parsons, Sir Joseph Thomson, Sir George Beilby, and other eminent scientists gave unstinted help. Up to July, 1918, the Board examined and reported upon some 53,000 inventions and proposals, of which about 36,000 related to the submarine and mine in attack and defence, and to engineering subjects; 13,000 to naval ordnance, ammunition, etc., and the rest to aircraft. Nothing passed the Board without the most careful sifting.

New organisation.

The reorganisation of 1918 had the object of organising research more completely, and bringing to bear upon it the knowledge of the men most skilled in mechanical, physical, and engineering sciences

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The general arrangements came under the direct supervision of the First Lord. Mr. Charles H. Merz, M.Inst.C.E., was appointed Director of Experiments and Research (unpaid), to supervise all the executive arrangements in connection with this further organisation. The Board of Invention and Research continued its work, and included a Central Committee, whose function, as hitherto, was to initiate, investigate, and advise generally upon proposals in respect to the application of science and engineering to naval warfare. The Director of Experiments and Research became a member ex-officio of the Central Committee, which was to be kept informed of the main problems arising for solution, and consulted as to the general lines of investigation and experiment. The Board of Invention and Research also included a Consulting Panel of Scientific Experts, and an Advisory and Secretarial Staff, which latter was brought under the Director of Experiments and Research.

The new department—Experiments and Research.

Under the new organisation, in place of the Technical Sub-Committees of the Board of Invention and Research, which had worked apart from, but in consultation with, the Technical Departments of the Admiralty, the Director of Experiments and Research attached a scientist and engineer to certain of the Technical Departments, as decided by the First Lord. These representatives, under the presidency of the Head of the Technical Department, formed an Executive Committee on Experiments and Research, for the purposes of that Department.

What was peculiarly advantageous in the system was the manner in which the Experiments and Research Department, with its technical staff and its many physicists, was brought, on the one hand, into the closest relation with the Navy through the Anti-Submarine and other Divisions at the Admiralty; and, on the other, with the chiefs and the scientific and directing authorities of the great engineering, electrical, and shipbuilding works of the country. The Experiments and Research Department, through its relation with the naval service, bringing to bear actual sea knowledge, obtained a complete understanding of requirements and possibilities. Upon this basis it instituted research and experiments in the laboratories and at experimental stations. When the device or invention had passed the experimental stage, the help was secured of those who controlled engineering and electrical works in various parts of the country in its manufacture.

The Navy itself is a highly scientific service, and its gunnery, torpedo, and wireless officers carried their work to a high degree of attainment. From them have come many invaluable inventions and

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devices, and the new department was the agency through which their suggestions and proposals often received practical application.

At certain of the naval bases, where the conditions were propitious, experimental stations were established, and special listening, signalling, and other schools were at work, as well as at South Kensington and elsewhere, in extensive laboratories. An executive committee of the Institution of Electrical Engineers was created, and there were anti-submarine committees in Lancashire and on the Clyde, a committee of engineers representing the industries of the Midlands located at Rugby, and directors of physical and electrical laboratories. Under the direction of the technical Naval Departments of the Admiralty, and the local committees of engineers, the experimental stations worked.

The fundamental advantage of the Admiralty system was the ultimate association which it established between the seamen and the scientists. Thus work of enormous importance, largely in relation to the suppression of the submarine and the mine, was most successfully conducted. The conclusion of the Armistice inevitably affected and changed the organisations charged with preparations for war. The Board of Inventions and Research did not appear in the February *Navy List*. The work continues, however, under new conditions under the Scientific Research and Experiment Department, which has as its head Professor J. C. MacLennan, who has the title of Scientific Adviser to the Admiralty.

Character of the Admiralty re-organisation.

From the above survey of naval administration it will be inferred that the system and machinery of the Admiralty possessed such flexibility and adaptability that they were readily and rapidly developed to grapple with the problems arising from the war. The methods of peace changed by natural evolution into those of hostilities. The separation of the duties of planning for war and directing war operations from those concerned with maintenance and supply was made definite, and yet not rigid, for the two were indissolubly linked. Each of the departments charged with these offices was developed into a larger organisation, fitted and prepared for the specific demands of the time. The advantage was gained which existed at the time when the Navy Board and the Commissioners of Victualling still stood outside the Admiralty, and when the Admiralty Board was as yet unburdened with the business of executing a mass of routine and mechanical affairs. The unification effected by Sir James Graham in 1831 was not undone, but the Civil Departments of the Admiralty—and with them the care of the *personnel*—were drawn away from the Naval Staff, which was reinforced for its high duties, while the Civil Departments grew and increased with more organic

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constitution to undertake and execute new responsibilities. Some things which were evolved at the Admiralty by the war have already passed away, and others will not continue, but the essential feature of the new state of things will endure, and Operations and Maintenance will remain two cognate, closely related, and yet essentially distinct, functions of the governing and organising authority of the Navy.

II.—*Personnel.*

The war evoked great qualities in the *personnel* of the Navy. All the devotion and training of previous years bore its fruit. Officers surpassed themselves in all that they did. The men displayed courage, skill and endurance, which were beyond all praise. This is not the place for eulogy. Yet it may not be unsuitable to quote here Lord Jellicoe's judgment from his book "The Grand Fleet, 1914–16":—

"Officers and ships' companies," he says, "were as keen as any Commander-in-Chief could desire. The long wait had never produced the slightest feeling of staleness. Officers and men were day after day striving to perfect the fighting efficiency of their ships, and well had they succeeded. The engine-room staffs had demonstrated early in the War that they would respond magnificently to any demand that I called on them to make, and they did it on the occasion of the Jutland Battle. The spirit and moral of the Fleet never stood higher than at the time of the Battle of Jutland, and because of that spirit, I knew that the Fleet under my command was the most formidable fighting machine in the world. . . . . Forty-four years passed in the Service had given me unbounded faith in, and admiration for, the British officer and bluejacket, but they surpassed all my expectations, and so long as that spirit endures, this country will be fortunate, and with adequate forces will be safe."

Flag-officers' retirements and promotions.

Many officers, early in the war and during its course, on reaching flag-rank, retired, in order that they might not block the promotion of officers junior to themselves. On the other hand at least twenty retired flag-officers, like the late Admiral Sir Alfred Paget and Admiral Sir James Startin, were placed in active service once more to serve as temporary Captains and Commanders in the Royal Naval Reserve. They commanded armed yachts, were in charge of Auxiliary Patrol areas, and directed mine-sweeping, and they were experienced organisers and administrators. Some of them became Commodores, R.N.R. Promotion in the Navy was stimulated by retirements and influenced in some degree by the casualties of war. Younger officers reached the flag list. Admiral Sir Charles Madden, appointed, after the dispersal of the Grand Fleet, Commander-in-Chief of the Home and Atlantic Fleets, was, in August, 1914, the eighteenth officer on the Rear-Admirals' list. Vice-Admiral Sir Roger Keyes, commanding the Battle-Cruiser Squadron, after his magnificent work at Dover, was forty-seventh on the Captains' list at the same date; the Hon. Victor Stanley, now Rear-Admiral in the First Battle Squadron, was fiftieth; Rear-Admiral Sir Edwyn Alexander-Sinclair, Third Light-cruiser Squadron, Mediterranean, was fifty-second; Rear-

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Admiral Edmund Grant, who holds the entirely new appointment of First Naval Member of the Commonwealth of Australia Naval Board, was 113th; Rear-Admiral Sir Reginald Tyrwhitt, who conducted so splendidly the work of the Harwich Flotilla, was 136th; and finally Commodore John S. Dumaresq, who now commands the Australian Squadron, was 183rd on the list. The rapid run of promotions since August, 1914, suggested by the facts cited above, gave a certain impetus to promotions from the Commanders', Lieutenant-Commanders' and Lieutenants' lists. In July, 1917, the new Captains numbered twenty-six, in December of the same year twenty-eight, in July, 1918, thirty, and in December, thirty. The new Commanders in each of the two promotions of 1918 numbered sixty. Not a few men were promoted from the lower-deck, through the grade of mate, to the quarter-deck. Many questions relating to promotion and pay were raised by the situation that developed during and after the war, and are now under consideration for settlement. The situation, chiefly as it affects the men, is discussed in a chapter of this volume.

Difficulty of providing officers and men.

No question related to national defence and national security could be of greater moment than that of the provision of an adequate supply of trained officers and skilled ratings for the Fleet contented and rewarded in their service. At the outbreak of the war the question of the *personnel* became one of great urgency. It had never been an easy matter to establish a sufficient reserve of officers and men maintained in full efficiency, and abreast of the ever-advancing scientific demands of the modern Navy. The really valuable reserves were to be found in the schools. Certain causes had led to a scarcity of officers in the junior executive branches, and like causes had operated in the case of the lower-deck ratings. The numbers borne rarely reached the numbers voted. At the same time the Fleet had been greatly expanded to meet the German menace, and a larger number of powerful ships were maintained in commission. These vessels, being more heavily armed and engined, caused a demand for a greater number of officers and men. The latter spent a good deal of time in the schools qualifying and re-qualifying for higher ratings. In the very early days of the war there was a requirement for an increase of the deck complements, as well as of men for the engine-rooms, owing to the heavy guns of the secondary armaments of the ships being so constantly manned at sea, against submarine attack in the daytime and destroyer attack at night, and to the necessity of the ships being ready for full-speed steaming at any time.

There was, however, the advantage that the nucleus crew system had raised the standard of the whole Fleet and had facilitated the embodiment of the Royal Fleet and Royal Naval Reserves. The

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Fleet had been mobilised in pursuance of policy which partook of the quality of wise prevision. The Fifth and Sixth Battle Squadrons of the Channel Fleet were manned with nucleus crews before mobilisation, and were consequently partly trained. The Seventh and Eighth Battle Squadrons were not so manned, and underwent training near Plymouth for close on a month before they could join Sir Cecil Burney's command. Meanwhile 1000 seamen ratings had arrived at Scapa to meet the war demands which have been alluded to.

Increasing numbers.

The expansion of numbers was rapid and progressive. Every Naval training establishment was busy. Boys were enlisted and trained in large numbers, and when the compulsory system came in special arrangements were made for passing the older men rapidly through the mill. There was special training for the engine-room ratings. Exclusive of the Air Force and of the Coast-Guard and Royal Marines serving ashore, the number of officers and men borne in the Royal Navy in July, 1914, was 137,045; a month later it had increased to 188,976, through the mobilisation of the Royal Marine Reserve, the Royal Fleet Reserve, the R.N.R. and the R.N.V.R. In August, 1915, the total number grew to 242,834, in August, 1916, to 284,809, in November, 1917, to 333,242, and in November, 1918, to 359,652. In addition were the Royal Naval Air Service, which, on November 15, 1917, before its transfer to the Royal Air Force, numbered 45,992 officers and men, and the Royal Naval Division, which reached its maximum of 24,300 in August, 1915.

Fleet Numbers in 1914.

The table on page 215—other tables indicating the situation in detail at later dates will be found in subsequent pages—shows the *personnel* of the Fleet, being the actual numbers borne in the critical days just before the war and ten days after its outbreak. The Royal Naval Division did not begin to be organised until a month later.

The Supply and Education of Officers.

Osborne and Dartmouth.

The supply of officers during hostilities was a matter of primary importance, and many difficult problems had to be solved. A prevalent assumption that the war would be of brief duration caused attention to be concentrated on pressing questions of mobilisation and supply to the partial obscuration of the need of assuring a continuous provision of officers. Before the war, Osborne and Dartmouth were turning out about 180 cadets annually, but, owing to the expansion of the Fleet, this number had ceased to suffice in the year before the war. On mobilisation, the staffs of Naval Officers at these colleges proceeded to their war stations; the work of the

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TABLE I.

	July 15, 1914.	August 15, 1914.		
	Total.	Officers.	Men.	Total.
Royal Navy	—	9,497	117,190	126,687
Royal Marines Afloat	—	295	12,826	13,121
Royal Marine Reserves	—	21	2,415	2,436
Royal Fleet Reserve, Royal Naval Reserve, R.N.R.(T.), R.N.V.R.	—	1,562	45,170	46,732
Total	137,045	11,375	177,601	188,976
AIR FORCE—				
Royal Navy	—	134	574	708
Royal Marines Afloat	—	2	119	121
Royal Marine Reserves	—	—	—	—
Royal Fleet Reserve, R.N.R., R.N.V.R.	—	4	15	19
Total	729	140	708	848
Coast-Guard	3,013	No	details.	1,910
Royal Marines Ashore	5,260	No	details.	9,283
Grand Total	146,047	—	—	201,017

Lieutenants at Osborne was turned over to the civilian masters, with a retired Captain in command; Dartmouth was closed altogether, and the cadets there, over 400 in number, together with the 150 under training in the training cruisers, joined the fleets. Thus Dartmouth became the means of providing an immediate supply of partly-trained junior officers, but this was at the cost of destroying its power to produce further output for some time.

Dartmouth College re-opened.

It soon became evident that the college must be re-opened if the great demand for young officers was to be met. Therefore, Dartmouth resumed its work and the normal process of passing cadets from Osborne began. The first batch remained at Dartmouth for six months instead of the normal two years, and subsequent batches remained for gradually increasing periods, which, however, varied, necessarily in correspondence with the requirements of the Fleet. These requirements could not be foreseen, and it was, therefore, impossible to lay down in advance a course of training adapted to the reduced period. In most cases the cadets had to drop the course at whichever point they had reached, when the need arose for their services. In all cases the course in the training cruisers had to be abandoned. Every effort was made to adjust the curriculum in such a way that the amount of technical knowledge, in such branches as navigation and electricity, should not be reduced dangerously below the normal level; but this inevitably involved interference with the general education of the cadets.

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Numbers from Dartmouth.

The number of young officers sent to the Fleet from Dartmouth was considerable. Those drawn from the "reservoir" in August, 1914, numbered 496, and during the remainder of the war 813 passed out of Dartmouth, unfortunately lacking various elements of the proper course of training. The evil effects of curtailing the course being so manifest, it was decided, in June, 1918, that a gradual return should be made to the normal conditions of five terms at Osborne and six terms at Dartmouth, in spite of the insistent demand for officers. The courses in the training cruisers were reinstated. As the period of hostilities lengthened, provision was made for increasing the accommodation at Dartmouth from 400 to 600, so that a greater number could be passed through the college; thereby the colleges not only recovered from the sudden drain on mobilisation, but succeeded in creating a larger rate of output in the following years than before the war. Thus they acted both as a reservoir and as a source of accelerated supply.

Special entries.

The latter function was also performed by the system of special entries from the public schools, which were made three times in the year instead of once, and the course of training in professional subjects was reduced to a short intensive course of a few months, and even weeks, carried on at the R.N. College, Keyham. By these means a rapid supply of partially-trained, but very excellent, material became available. Up to October, 1918, 422 midshipmen had joined the Fleet from Keyham. The Navy secured its pick among boys of a much higher intellectual standard than would in normal times present themselves as candidates. Many came from Rugby, Winchester, Wellington, Haileybury, Charterhouse, Dulwich, and other public schools, and a considerable number from grammar schools. The product was excellent, and many observers were led by this fact to the conclusion that the system of direct entry at the end of the public school course was preferable to entry into the Naval colleges from preparatory schools. The comparisons were fallacious, though experience has proved the great value of the special entry as a means of providing a rapid supply of officers in a long war, and there are strong reasons for retaining the system.

Results.

By the means described, the Fleet received throughout the war a continuous supply of young officers. The Director of Training at the Admiralty controlled extremely important duties. Special courses were arranged for officers to increase their knowledge. The Royal Naval Reserve officers were brought into these schemes. Notwithstanding the enormous demand for officers, including many specialists, every class of ship in the Navy had usually her full complement of capable officers, ever growing in experience and never failing in the qualities required.

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Further education for young officers.

In order to make good what was wanting in the general education and professional training of young officers owing to the situation which had arisen, it was announced in the autumn of 1917 that all officers who had not undergone training-cruiser courses should take a six months' preliminary course at Greenwich or other educational establishment, followed by professional courses and by examinations in professional subjects, on which their substantive rank and seniority would depend. As the numbers involved were too great to be dealt with at Greenwich, it was decided to send the young officers in batches of 400 for the preliminary course to Cambridge, where special courses of study were arranged for them. Those in mathematics, navigation, science and engineering were the same for all, and were intended to assist in the subjects needed for the subsequent courses in the technical schools at Portsmouth, etc. A number of optional courses were arranged. Owing to differences between naval training and that of undergraduates, in the periods of residence, etc., it has not been found practicable to make use of the University lectures for candidates for honours, but the lectures are given by some of the most eminent lecturers in the University, so that much of the intellectual stimulus and benefit of a University course is at the officers' disposal.

Fleet Numbers in 1915–16.

It is obviously impossible in this chapter to treat of every aspect of the question of the *personnel*. Only the more salient features can be dealt with. At this point (p. 218) it will be convenient to give a table corresponding to that on p. 215, showing the expansion of the *personnel* up to August 15, 1916. In the previous table it was shown that on August 15, 1914, the Navy and its reserves, had a strength of 188,976, the Air Force of 848, the Coast-Guard of 1910, and the Royal Marines ashore of 9283, giving a grand total of 201,017. The Royal Naval Division was formed in September, 1914. In the table on page 218 the Royal Marines ashore include the Submarine Miners, formed in 1915.

Men of the Lower Deck.

Training of men.

These tables of numbers show the increase in the lower-deck ratings of the Navy in the early years of the war and in the critical year 1916. The provision of men for the Navy was not less important than that of the officers. There was never any real scarcity. Recruiting was brisk, and all the naval training establishments were busy. Nothing could have been better than the sound and practical training given by experienced officers. At Shotley the course varied from six to ten months, including twelve weeks' seamanship, with

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TABLE II.

	August 15, 1915.			August 15, 1916.		
	Officers.	Men.	Total.	Officers.	Men.	Total.
Royal Navy	10,669	134,420	145,089	11,235	153,960	165,195
Royal Marines Afloat	306	14,120	14,435	346	14,920	15,266
Royal Marine Reserves	21	3,344	3,365	22	3,320	3,342
Royal Naval Reserve, R.N.R.(T.), R.N.V.R.	6,422	73,523	79,945	9,336	91,670	101,006
Total	17,418	225,416	242,834	20,939	263,870	284,809
AIR FORCE—						
Royal Navy	714	8,390	9,104	1,520	19,373	29,893
Royal Marines Afloat	7	226	233	7	116	123
Royal Marine Reserves	—	65	65	—	9	9
Royal Fleet Reserve, R.N.R., R.N.V.R.	625	689	1,314	874	857	1,731
Total	1,346	9,370	10,716	2,401	20,355	22,756
Royal Naval Division	918	23,382	24,300	933	19,831	20,764
Coast-Guard	No	details.	2,635	No	details.	2,801
Royal Marines Ashore	No	details.	9,147	No	details.	10,952
Grand Total	—	—	289,632	—	—	342,082

half-time school instruction, followed, by selection, by ordinary gunnery (10 weeks), advanced gunnery (24 weeks), wireless (23 weeks), or signals (22 weeks), the youth then being rated Boy, 1st class, Signal Boy, or Boy Telegraphist, thence proceeding to Able Seaman. The boys in the Powerful at Devonport went through a ten-weeks' course of practical seamanship. In the Indus, where the training of the boy artificers was particularly thorough, the course was abridged during the war. At the Royal Naval Barracks, Devonport, magnificent work was done in turning out smart, well-trained seamen. The course was of six weeks for ordinary seamen, including discipline, drill, seamanship, internal organisation of ships and duties aboard, etc. The gunnery ratings had a longer course, and went through a very complete training within the time available. When compulsory service was introduced older men arrived, and special arrangements were introduced to convert the raw material into the satisfactory article—the well-grounded seaman, whose training and education were continuous throughout his service.

Boys for the Navy.

For many years previous to the hostilities the work in all the training establishments and in the specialist schools had been very efficient. A boy of 15½ years spent the first year of his Service life in learning the rudiments of his profession and in school. The advanced school course embraced Algebra, Trigonometry, Navigation, Mechanics and Electricity, and a few years later he was sent to his specialist school for Gunnery, Torpedo, or Wireless Telegraphy.

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On the outbreak of hostilities these school courses were either considerably shortened or were entirely suspended. Every available man and boy was required, as soon as he had received sufficient training, for the ships ready for commissioning. The Grand Fleet was in the North Sea; other squadrons were guarding the trade routes and hunting for the German raiders; and for the first year of the war it was not possible, in sea-going ships, to give detailed attention to the education of the younger seamen. However, in October, 1915, Sir John Jellicoe issued the important Grand Fleet Order (No. 192) on this subject, and published a syllabus for the instruction of boys similar to the scheme in force at Shotley.

Education in the Fleet

The Grand Fleet was then at Scapa, and the suggestion was welcomed by all the ships, not only because of the educational value of the instruction, but also as a means of employing the men during those long and wearisome winter evenings. Some interesting experiments were tried in the way of lectures, debates, and reading circles in many of the ships.

It was, however, felt that a more continuous regular system was required, and in December, 1915, the Commander-in-Chief applied for an experienced schoolmaster to be attached to each of his Battle and Battle-Cruiser Squadrons, to supervise the work done by the acting schoolmasters in the ships. A few months later a schoolmaster was appointed to each of the Light-Cruiser Squadrons and Submarine Flotillas. Finally, in June, 1916, the Admiralty added a trained certificated schoolmaster to the complement of every warship down to and including light cruisers.

Schoolmasters appointed.

It may be said that from this time onward the Grand Fleet became the training establishment of the British Navy, and with the entry of 240 schoolmasters, many of whom were graduates of British Universities, for the period of hostilities only, school instruction became an organised and progressive institution, and was greatly valued by the men and boys in the Fleet. It became possible, in spite of the constant and varying movements of ships, to re-introduce the examinations which had remained in abeyance since hostilities began. On June 15, 1916, the educational test for the rating of petty officer was held. Over 2000 men had entered for this examination, but the numbers were reduced by the losses at Jutland, and about 1500 sat. This test was held every quarter during the remainder of the war, and on an average about 1200 men took the examination. The educational examinations for the Marines were similarly held each half year.

In consequence of experienced men being required to man the new ships that were constantly being added to the fleets, a demand

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was made on the ships that had been longest in commission to supply the specialist ratings of the gunnery, torpedo, and signal departments. It became imperative that these ratings should be trained in the Grand Fleet for this purpose. Schemes of instruction were drawn up, and, as far as the exigencies of the Service would permit, regular and systematic training was carried out, the theoretical part of the instruction being entrusted to the schoolmasters.

Specialist ratings.

Very early in the war it was discovered that a large number of telegraphists would be required, and the Commander-in-Chief arranged that a part of the Sokoto, which was based on Scapa as a torpedo sub-depôt, should be converted into a school to accommodate a class of 60 men. These men did a seven weeks' course, and, on the results of a severe examination, were advanced to higher ratings.

Grand Fleet orders.

During the year 1916 very great progress was made in school organisation, and in September of that year the Commander-in-Chief issued another Grand Fleet Order on the examination of young seamen. It included the following statement :—

"I desire to impress on all officers the imperative necessity of taking every opportunity in their power to forward the education of the boys and younger seamen of the Fleet. The boys now being recruited are carefully selected from large numbers who are eligible, and it is incumbent on us to make the best use possible of the material at our disposal, and to prepare the *personnel* of the future for anything that may be in prospect for them. Officers are reminded that these boys are at the most receptive age, and it is of the highest importance that their education should be organised on regular lines."

The importance of giving the best attention to the mental development and school training of the younger seamen was also fully emphasised by Sir David Beatty on his taking over the command of the Grand Fleet. The Admiral issued a Grand Fleet Order on education and training on November 20, 1916, in which he observed :

"The attention of flag officers and officers in command of H.M. ships is drawn to the urgent importance of promoting to the utmost the education and training of the younger men of the Fleet in order to maintain the standard of efficiency in the future ; to ensure qualified gunnery and torpedo ratings being available for new constructions ; and to enable the future supply of petty officers, warrant officers, and mates to be met. A sound education, the importance of which increases with every successive development of technical science, is the first essential, especially for boys and younger ratings, who are at an age when the continuation of their training-ship studies will have the most beneficial result. School for boys is to be compulsory, while young ordinary and able seamen should be encouraged to attend, and progressive courses be arranged, mechanics, electricity, magnetism, and elementary navigation being included in the syllabus of the more advanced classes. I feel sure that flag officers and captains realise the extreme importance to the future efficiency of the Fleet of educating and training the boys and young seamen, and I count on their hearty co-operation in making special efforts to carry out systematic and thorough instruction of the nature specified."

In April, 1917, the Admiralty approved of a test for the accelerated advancement of boys to men's rating at 17½ years instead of the usual age of 18, provided the boy passed a professional examination in

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seamanship and also a school test. This test embraced algebra, trigonometry, logarithms, geometry, navigation, general knowledge, geography, naval history, mechanics and electricity. This test was held quarterly, and in the Grand Fleet about 400 entered on an average and about 50 per cent. qualified in these subjects.

Higher education test.

Great encouragement was given to school training when the Admiralty instituted the "higher education test" in March, 1918. This is not a qualifying test for advancement, but a certificate is issued, and it is greatly prized. The test can be taken when a man has passed education test Part I. The subjects for this test are those as enumerated for the accelerated promotion for boys, but the examination is of a much higher standard. In addition to these schemes, it is pleasing to record the efforts taken to relieve the monotony of the long-continued stay at Scapa by lecturers, who were invited to visit the Fleet; also the officers and men who from time to time visited the Western Front, gave lectures and talks to their shipmates when they returned on their experiences during their short stay with the Army.

The Auxiliary Patrol and the Mine-Sweepers.

Character of the mine-sweepers.

The Auxiliary Patrol and its splendid officers and men, exercising sleepless vigilance throughout the war, rendered noble service to the country and the Allies. It was the watchful guardian of the Mercantile Marine. The epic story of the mine trawlers and drifters will make a great page in the history of the war. The men belonged to the generation of the old seafarers. They fought with the gales and were brothers of the storm. They came from Lewis, Skye, Thurso, Cromarty and the ports of Fife—all of them volunteers; they had brought their fish into the Forth; they had come many a time deep-laden into Whitby and all the havens along the coast; they were known as valiant labourers of the sea in the salt port of Grimsby. Many of them came from the Channel and the ports of Wales, and the stiff-built boats which they have carried into the North Sea, out into the Mediterranean, to the Dardanelles and to the Otranto Barrage, have many a time beaten out from Brixham, Fowey and the Fal. The men of the North Sea ports predominated. Wherever they went they never lost their character; they maintained the chivalry of their craft. They fished for mines as they trawled for fish, and they never told anyone that they had saved thousands of lives.

On the outbreak of war the only organisation of small craft actually in being for mine-sweeping work was a nucleus force, organised through the long foresight of Lord Fisher, under the direction

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of the Inspecting Captain of Mine-sweeping, with the following objects:—

(1) Development of mine-sweeping generally.
(2) Training of officers and men in mine-sweeping.
(3) Provision of vessels, material and *personnel* for employment in case of war.

Mine-sweeping service.

The vessels permanently employed were twelve trawlers, manned by Naval ratings, which were used for instructional purposes. Arrangements had also been made with the trawler owners at the principal fishing ports for the charter by the Admiralty of over 100 trawlers in the event of an outbreak of war. A force recruited from the fishermen engaged in steam trawling, and known as the Trawler Section of the Royal Naval Reserve, numbering approximately 1020 skippers and ratings, had been enrolled under the R.N.R. regulations, at special rates of pay, and the greater proportion of this force had received instructions in mine-sweeping on board the Admiralty trawlers, which had visited the fishing ports for this purpose during several years previous to hostilities. The necessary mine-sweeping stores had been distributed in readiness at bases round the coast for the number of trawlers which it was intended should be sent to each at the outbreak of war.

A number of officers of the retired and emergency lists, who had voluntarily undergone training in the Admiralty mine-sweeping trawlers, had received war appointments to the respective bases at which they were to be prepared to undertake mine-sweeping with trawlers in the event of war, and these officers had, during peace time, visited these bases and made themselves aware of the local conditions. Mobilising Officers had also been detailed for the various fishing ports, and had received their instructions for the charter, manning and despatch to their mine-sweeping bases of the trawlers allotted to each.

Within a few weeks of the commencement of hostilities, the mine-laying activities of the enemy necessitated a large expansion of the mine-sweeping force, and more trawlers were chartered and more men enrolled in the Royal Naval Reserve (T) for this purpose. This organisation was rapidly expanded and augmented by the addition of yachts, drifters and motor-boats for patrol and anti-submarine duties. All these craft were chartered from private owners, the first vessels specially constructed for patrol purposes being the 550 American motor launches which were ordered in the latter part of 1915. An additional thirty were also required in 1918. Other special Admiralty construction included fifteen whalers (1915), 250 trawlers

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(1916), increased later to 540, 150 drifters (1916), increased later to 335, and eighty-five patrol gunboats.

The *personnel* of this service was practically exclusively provided from officers and men specially entered for the duty in it, for "hostilities only." It consisted of temporary Royal Naval Reserve and Royal Naval Volunteer Reserve officers; chief motor mechanics and motor mechanics R.N.V.R.; chief skippers and skippers R.N.R.(T.) and other R.N.R.(T.) ratings, with a small number of mercantile ratings (maximum about 3500), who formed the crews of the yachts.

R.N.R. and R.N.V.R. training.

As regards training, the Royal Naval Reserve officers, who were professional seamen, were put through what was generally a much abbreviated course at either Portsmouth or Plymouth, including gunnery, signals, discipline and torpedoes (including depth charges, etc.). The Royal Naval Volunteer Reserve officers, mainly amateur yachtsmen, were trained in a special establishment at Southampton, H.M.S. Hermione, and in addition to the instruction imparted to the R.N.R. officers, were also given courses in navigation, seamanship, and the practical handling of the craft in which they were to serve. None of these temporary entries, either officers or men, had previous experience of naval discipline or gunnery, etc., but in spite of the pressure under which their training was conducted, a high standard of efficiency was reached, owing largely to the keenness and enthusiasm brought to bear both by instructors and instructed.

The yacht ratings were trained at Portsmouth on similar lines as those adopted for active service temporary entries. The mechanic ratings (for motor launches, coastal motor-boats, etc.) had special courses in the Hermione adapted to fit them for the special duties for which they were required. These mechanics were all skilled men at their trade (petrol engines) before entry. The system of training in gunnery, use of explosives and signalling which, owing to the demand for men's services had been very limited, was elaborated as the war progressed, and additional pay was granted to qualified men.

At the cessation of hostilities the Patrol Service employed over 3000 commissioned officers, nearly 2500 mechanic ratings in motor launches, and the R.N.R.(T.) force approximated 40,000 chief skippers, skippers and ratings, distributed amongst trawlers, drifters, paddle mine-sweepers and motor launches, and serving in every part of the world where the Navy was actively engaged.

Numbers employed.

Mine-sweeping did not cease with hostilities. In fact there were (in March, 1919) infinitely more mines remaining to be swept up than had been swept up during the war. This will entail the employment of a large number of officers and men until late in the year.

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The following table shows the number of the ranks and ratings of the Auxiliary Patrol Service during the war.

TABLE III.

	Dec. 31, 1914.	Dec. 31, 1915.	Dec. 31, 1916.	Dec. 31, 1917.	Nov. 11, 1918.
Commissioned Officers	635	1,393	2,460	2,631	3,058
Chief Skippers and Skippers	740	2,003	2,144	2,250	40,000
R.N.R.(T.) Ratings	7,109	29,685	35,411	37,605	
Mechanics	100	450	1,016	1,402	2,461
Yacht Ratings	1,400	3,400	3,100	2,450	2,300
Total	9,984	36,931	44,131	46,338	47,819
*Number of Vessels.**	745	2,236	2,556	3,073	3,714

BOOM DEFENCE AND BARRAGE SERVICE.

Closely related to the duties of the Auxiliary Patrol and the mine-sweepers was the work done by the officers and men of the Boom Defence and the Barrage Service. The *personnel* were very largely drawn from the Mercantile Marine and the fisheries, who were selected and trained. The Boom Defence Service was responsible for placing defences against submarine and surface attack at the principal war anchorages used by the fleets. From the first the work was arduous, and the *personnel* of the Service was called upon to exercise much ingenuity and initiative, especially in the early days of the war, when it was urgently necessary to improvise defences. Their duties grew enormously with the development of the submarine menace, and as the theatre of operations extended to the Mediterranean and overseas, and fresh war measures, such as the increase in the protection of new anchorages for convoys, were introduced from time to time. Dangerous enterprises were also successfully undertaken, one example being the laying of the barrage across the Straits of Dover, a work which went far to hamper the movements of enemy submarines.

Effective barrages were constructed and important navigable channels denied to the enemy by the sinking of prepared ships, the depositing of heavy structures, and the erection of obstructions of a

* The descriptions of the craft in which the mine-sweepers served is shown in the following statement of losses :—

Vessels.	
Yachts	13
Trawlers	255
Motor Launches	22
Motor-Boats	6
Drifters	124
Paddle Mine-sweepers	15
Miscellaneous	4
	439

The total loss of life on these occasions was 232 officers, 2040 ratings.

Causes of Losses.	
Struck mine	194
Sunk by enemy	75
Captured	1
Wrecked or cast away	65
Sunk in collision	70
Burnt	15
Not known	19
	439

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permanent character. All these preparations called for a high degree of skill and seamanship, and were often carried out under difficult and trying conditions.

The work of dismantling the defences was no less arduous. The salving of a vast quantity of valuable material necessitated the delaying of the demobilisation of many who had strong claims for early release, but the Admiralty relied upon the loyal and patriotic spirit with which the strain of war has been borne by the Boom Defence *personnel* during the hostilities.

Thanks of the Admiralty.

The Admiralty publicly thanked the officers and men of all branches, and the fishermen who joined this service:

"The arduous nature of the work, necessarily performed with small vessels, and the monotony at times of the duties, calling for ceaseless vigil and energy, are recognised; and My Lords have pleasure in recording their opinion that the Boom Defence and Barrage Service can rightly claim that its contribution towards the protection of His Majesty's and Allied ships and vessels making use of the permanent and temporary anchorages in all the theatres of naval operations has been of inestimable value to the Fleets and Mercantile Marine not only of Great Britain, but of the Allied and Associated Powers."

Fleet Numbers in 1917–1918.

The table which follows is in continuation of those given on pp. 215 and 218. It shows the progressive increases which were made in the *personnel*. The figures of the Royal Marines ashore include the R. M. Labour Corps, formed February 2, 1917, and the R. M. Engineers, formed March 4, 1918.

Table IV.

	November 15, 1917.			November 15, 1918.		
	Officers.	Men.	Total.	Officers.	Men.	Total.
Royal Navy	12,877	183,218	196,095	13,675	198,459	212,134
Royal Marines Afloat	378	16,487	16,865	454	17,108	17,562
Royal Marine Reserves	24	3,565	3,589	50	3,888	3,938
Royal Fleet Reserve, Royal Naval Reserve, R.N.R.(T.), R.N.V.R.	11,289	105,404	116,693	16,077	109,941	126,018
Total	24,568	308,674	333,242	30,256	329,396	359,652
Air Force—						
Royal Navy	3,301	40,576	43,877	—	—	—
Royal Marines Afloat	6	121	127	—	—	—
Royal Marine Reserves	—	8	8	—	—	—
R.F.R., R.N.R., R.N.V.R.	1,088	892	1,980	—	—	—
Total	4,395	41,597	45,992	—	—	—
Royal Naval Division	934	19,981	20,915	781	13,560	14,341
Coast-Guard	No	details.	3,109	742	3,539	4,281
Royal Marines Ashore	No	details.	17,043	1,060	27,982	29,042
Grand Total	—	—	420,301	32,839	374,477	407,316

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Instruction of the Mercantile Marine.

When the Mercantile Marine became the object of the enemy's attack, the Admiralty adopted special methods for the instruction of its officers and men in defensive measures to combat the submarine. In the situation which had arisen, it became necessary to bring the whole of the Mercantile Marine under naval direction and control, and practically it was embodied with the Navy, and for the most part provided with defensive armaments. When Mr. Balfour was First Lord of the Admiralty, speaking in the House of Commons on March 7, 1916, he directed attention to the fine service of the officers and men of the Mercantile Marine serving in transports, cargo vessels, and other ships. "On them," he said, "we depend, not less than on our armed forces, for maintaining the necessary economic basis upon which all war must ultimately be waged."

Defensive measures.

During the first two years of the war, the submarine menace though severe, did not assume a dangerous aspect, and the necessity for individual instruction was not very apparent. As, however, more ships began to be armed, and ships to be attacked by gun-fire from long range, it became obvious that some instruction was necessary for the officers of merchant ships to enable them to make the fullest possible use of their defensive armaments. With this end in view, arrangements were made in July, 1916, whereby such officers of the Mercantile Marine as might so desire, were enabled to attend a short course of gunnery at the Naval Gunnery School, Chatham.

Officer instructors.

It was recognised that officers in the Mercantile Marine did not as yet generally realise the importance of adopting such defensive measures as zig-zagging, darkening ship, etc. Therefore, in January, 1917, 50 Royal Naval Reserve officers were specially trained for the purpose of instructing the officers of the Mercantile Marine in these important points, and also in gunnery.

These instructing officers were sent to sea in vessels of the Merchant Service, and transhipped from one to another as opportunity offered. After a time, this was found to be wasteful of effort, and in April the majority of the officers were withdrawn from sea and distributed among the staffs of the officers in charge of defensive armaments at the principal shipping, and, later, convoy-assembly ports, where they spent their time in instructing and advising masters and officers of vessels arriving at those ports in defensive measures to be adopted.

Submarine menace courses.

It was found, however, that the instructional course mentioned above did not draw a sufficiency of candidates, and a voluntary weekly course at the Gunnery School, Chatham, was therefore started. The first

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course commenced on February 27, 1917, and was well attended and exceedingly well reported on. This course became immediately popular. Those who underwent it learned the use of hydrophones, and thoroughly appreciated the importance of using every defensive or protective means available. Similar courses were started at Portsmouth and Cardiff in June 1917, that at Cardiff being shifted to Glasgow in November, on account of bad weather conditions in the Bristol Channel.

Value of the training.

Statistical evidence proved so completely the extreme value of these courses that, in June, 1918, they were made compulsory, under the Defence of the Realm Act, for masters and chief officers of vessels of 1600 tons gross or more, and, in order to allow for the increased attendance expected, a further course was started at Devonport Gunnery School. The compulsion to attend was extended to second officers, and the limit of tonnage reduced to 1000 tons gross in September, 1918. At these courses, officers were taught the elements of gunnery and fire control, the necessity for and theory of zig-zagging, including practical demonstration of attacks, the necessity of properly darkening ship, how to use a smoke screen, and many other details connected with measures found necessary for the defence of their ships. A day was spent at sea in a gunnery tender in witnessing attacks by a submarine and practical demonstrations of smoke screens, and in target practice.

Courses in Otter mine protection gear.

As a protection against mines, a form of Otter gear was adopted for merchant vessels, and fitting generally was commenced in April, 1917. A course of instruction in this gear was instituted at Portsmouth, in May, 1917, and practical demonstration was given in a vessel under way. In July, 1918, a similar course was started at Glasgow, in connection with the submarine menace course.

Apprentices and cadets.

With a view to giving instruction to the apprentices and cadets of the Mercantile Marine, courses were started for these young officers at the gunnery schools at Portsmouth, Chatham and Devonport in the summer of 1917. The course lasted ten working days, and included instruction in gun drill, etc., at the various types of guns mounted in defensively armed ships.

Gunnery course at the Crystal Palace.

As each ship was armed, a nucleus gun's crew of trained Naval ratings or marines was put on board, the loading numbers being made up from the Mercantile crew, who were trained in their duties by the Naval gunlayer. As the calibre of the armaments increased, necessitating larger gun's crews, some scheme of training for the Mercantile ratings became imperative. A course at which 400 ratings a week could receive instruction in gunnery was therefore started at the Crystal Palace, in April, 1917. The course lasted ten working

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days, and included instruction in loader, gun drill and sight setting at the various types of guns mounted in defensively armed merchant ships. The men qualified under this scheme were entitled to sixpence a day whilst serving as members of the gun's crew in such ships.

The following is a summary of the instruction given to the Mercantile Marine from February 27, 1917, when submarine menace courses were started, to November 22, 1918, when these courses were closed on the cessation of hostilities.

TABLE V.—SUBMARINE MENACE COURSES.

Port.	Voluntary Courses. February 27, 1917 to June 3, 1918.		Compulsory Courses. June 3, 1918 to November 11, 1918.		Totals.	
	Masters.	Officers.	Masters.	Officers.	Masters.	Officers.
Chatham	1,798	839	481	637	2,279	1,476
Portsmouth.	207	1,267	396	477	603	1,744
Devonport	—	—	455	548	455	548
Glasgow (4 days)	190	206	666	785	856	991
Cardiff and Glasgow (2½ days)	427	847	—	—	427	847
Totals . . .	2,622	3,159	1,998	2,447	4,620	5,606

Officer Instructors.—Number of visits paid to ships for the purpose of instructing Masters and Officers 21,064

Apprentices.—Total number who attended Gunnery Courses at Portsmouth, Chatham and Devonport 1,300

Merchant Ratings.—Total number who attended Gunnery Courses at the Crystal Palace 8,507

Officers and men who received instruction in Signals 45,324

Some timely reflections.

The foregoing survey of the *personnel* of the Navy is necessarily incomplete. It could not touch every aspect of an immense subject. Yet some conclusions may be drawn. Nothing has been wanting in the services of the officers and men of the Navy. They must have their reward. Nothing must be grudged to them that is reasonable in pay or pension. The Navy has upheld its high traditions, and has accomplished more, in many respects, than ever the Navy accomplished before. The country is its debtor. It did, for example, an immense work in training and embodying for war service the Mercantile Marine, and its bond with the Merchant Service must be maintained. The Naval Reserves will continue. Recently requalifying courses in gunnery and torpedo have been arranged for officers of the Royal Naval Reserve.

The Fleet is now being reduced, and demobilisation has inevitably taken the place of the activities in providing and training officers and men which were so great in the early days of the war and throughout its course. In March, 1919, it was announced that 30

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youths had passed the examination for cadetships in the Royal Navy; at the same period of 1918 the number admitted was 85. What has been gained will not be lost. The *personnel* of the Navy, though on a reduced establishment, will be entered and trained as before, but in the light of war experience. There is no finer training anywhere than that which the Navy affords. Those officers and men who leave the active service must ever be in the mind of the Government. The public services must absorb many officers of the regular line for whom no appointments are available either in the Admiralty departments or in the dockyards or other establishments. In the Consular service, and in the new department of Ways and Communications, or in other Government departments, positions must be found for Naval Officers who have finished their service, and than whom no men are better fitted for, or more capable of executing, active and vigilant work. This is a natural reflection arising from a study of the training and duties of the *personnel* of the Navy in the war.

JOHN LEYLAND.

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CHAPTER X.

Naval Education.

"For good or ill, education, in its broadest sense, is more potent than any other force at the disposal of the State. Sound education is the key to all success, and the foundation of all prosperity and greatness."

The fundamental importance of right naval education will not escape anyone. Upon the competence of the officer, and, in the last resort, of the officer in chief command, everything must depend. To fill a high command in time of war with real success is one of the most difficult tasks that any human being can undertake. The intensive development of character and intellect, the many qualities that must be worked up to their highest efficiency before we can produce a Napoleon or a Moltke, constitute a task that is almost superhuman. It therefore follows that the education of a naval officer who may have to hold high command in war must be considered with the utmost care, and must be in every sense complete. The variety and complexity of the matters he must study clearly demand that he shall confine himself to essentials, and cut out non-essentials. This is a guiding principle.

Defects of the present system.

How does our present system meet our most urgent needs, and to what extent should that system be modified? When we think what a tremendous store of wisdom and knowledge had been garnered from the experience of the past 1000 years, and is being used daily in numberless professions, it must surely appal us to consider how little is handed out to the rising generation of naval officers. There is drawn into our net the pick of the British race, and, alas, too often we find them slowly becoming narrow-minded, materialists, or self-seekers. This is no fault of the Naval Officer; it is merely the normal result of the English temperament modified by the environment and the commercial standards of the twentieth century. The Englishman has many fine qualities which have proved in the war of enormous value, but intellectually we have lamentably failed to observe and guard against the pitfalls spread for us by 100 years of peace and unexampled prosperity. So it comes about that we tackle every naval problem as ingenuous amateurs. Our professional knowledge is based as to 99 per cent. on our own experience, as to only about 1 per cent. on the experience of our ancestors. We experiment again and again with fallacies that were exploded fifty years ago. We make decisions by the light of nature, without the least regard to

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sound principles evolved from centuries of experience. Let any senior officer who reads these words consider carefully two things:—

(*a*) The sum total of all he was ever taught by his various instructors and teachers.

(*b*) The sum total of all the wisdom and professional knowledge he now possesses that is of real value to him.

I think he will find that 80 per cent. of what he was taught was of very little permanent value; while 80 per cent. of (*b*) was never taught him, and had to be picked up anyhow; either by mere accident, by the slow process of cumulative experience, or by self-education.

It is admitted that in many cases education can only sow the seed, which each man must tend and cultivate for himself. But let us see to it at least that the seed is sown, and that every naval officer has a chance to know clearly what purpose we desire his education to accomplish, and in what way he can assist in its fulfilment. To get the best results we require his earnest co-operation, while the necessary zeal and energy must be supplied and sustained by inspiring him with high ideals. Only thus shall we turn our naval officers into leaders of men, competent to fight their country's battles, and worthy to win them.

Suggestions.

It is proposed here to give a brief outline of the principles we must be guided by in order to eliminate the misfortunes of the past. By far the best way to circulate and make practical use of sound ideas on this subject would be to compile and issue an official "Manual of Education," which should be readily accessible to every junior officer, besides being studied by all ranks to ensure general compliance with its principles. The suggestions here set down are intended to indicate a few of the ideas that it is hoped will find acceptance when the official Manual comes to be compiled.

It must be clearly understood that education cannot aim at developing every one similarly. Whatever value there may be in uniformity, it can only prove disastrous in human training.

We cannot make the oak tree grow like the poplar, and any attempt to turn out naval officers like bullets from a mould will ruin the Navy and do no good to the officers. Once we begin the process of moulding, the priceless qualities of initiative and imagination begin to be crushed out by the iron walls of the mould. The main requirement, then, is that in due course every man shall know as well as his instructors, or better, exactly what he ought to do with his life and what training will ensure his doing it most successfully.

Ideals.

This brings us at once to the question of ideals. It must be made abundantly clear to every young officer that suitable ideals and a

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high standard of conduct are essential to good work. The U.S.A. War College Manual of Army Training lays down that "An absolute and unqualified devotion to the welfare and success of our country is an indispensable requisite that has always constituted the soul of our Army." No great success is possible unless inspired by ideals much higher than the mere hope of personal advancement.

Patriotism and self-sacrifice.

The dedication of our lives to the service of the State, the lifelong training whereby we fit ourselves to fight our country's battles, the determination to win those battles regardless of what it may cost us, these in themselves are high ideals; therefore in every naval officer the twin virtues of patriotism and self-sacrifice must be developed till they become instinctive. It must be shown that, as at games, to play for the side is everything. It must be pointed out that self-interest involves selfishness and thoughtlessness of others. Therefore the selfish officer will never take sufficient interest in the welfare of his men, and, as a result, he will never command their affection or respect. Therefore he is less likely to succeed. In this case, as in many others, self-interest does not always "pay."

Before leaving ideals, it may be pointed out that no officer need chain himself to the bleak ascetic view that "virtue is its own reward." In practical affairs, a lifetime devoted to the service of the State is very rarely devoid of personal recognition and reward. Many great men have risen to fame by devoting their energies to the welfare of others, and many, like Napoleon, or his more recent imitators, have fallen only when their personal ambitions began to carry more weight with them than the welfare of mankind.

Moral courage.

Now we come to moral courage, being that form of courage whereby we display a fearlessness of responsibility and a determination to do what is right and best, regardless of consequences. It may lead an officer to disregard printed instructions that are obsolete, or perhaps to initiate action that sudden circumstances require without waiting for authority to do so. In either case he is guided by what he considers best for the Service, and he takes the responsibility entirely on his own shoulders. This courage, though often allied with physical courage, is entirely different from it. It is of enormous value in many directions, for not only does it lead to fearlessness of responsibility—that bugbear which many are weighed down under—but also it is in large measure the parent of initiative. It was chiefly moral courage that was required by Nelson when he put his helm up to break the line at St. Vincent. Brilliant initiative immediately followed on it.

While dealing with moral characteristics we may touch on "morals." We may sum up all the requirements by saying that a

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young Naval Officer will never be fully efficient unless he is clean in body and mind. The old Roman ideal—*mens sana in corpore sano.*

We pass on to other qualities of the Naval Officer. In the young, certain qualities, like initiative and imagination are tender growths which may very easily be killed. Zeal is a compound of the natural wish to succeed and the more ideal aim to achieve great things for the benefit of one's country. But harshness or repression will soon wither it away; therefore, the young must be encouraged to develop according to their various aptitudes, and to enquire, to experiment, and to make suggestions. Tact, to overcome their shyness and diffidence, and sympathy to encourage them onwards, are of infinite value. Always, we must remember that zeal, imagination, and initiative can easily be crushed by bad training, and may never blossom again.

Physical fitness.

Physical qualities are as important as moral qualities. Without physical fitness education can hardly be assimilated, and may easily prove fruitless. Education which impairs the eyesight, or renders the student anæmic or mentally weary, is definitely harmful. But education must not merely content itself with avoiding these evils, it must impress on young officers the great importance of constant fitness, explaining how even bad teeth or a sluggish liver may impair at a critical moment the store of vitality on which we rely for mental alertness and prompt decisions. It is said by some that Napoleon lost the battle of Waterloo mainly on account of a temporary indisposition during the early part of the day. It has been said that we won the battle on the playing-fields of Eton. Let us be very careful that we do not lose some future battle in the class-rooms of Dartmouth.

Physical energy is dependent on complete physical fitness. If we consider the brain as a machine for grappling with intellectual problems, physical energy may be called the dynamo that drives the machine; also, it is on physical energy (and physical courage) that we are mainly dependent for those powers of endurance, which, perhaps more than anything else, decide the final issue of a hard-fought day. Physical courage was described by Marshal Saxe as the most important quality for a great leader to possess. Without it a man may be a great strategist, or may display invaluable ability in many directions; but if he is to lead men or fleets in battle he must possess physical courage in a marked degree.

Training.

The initial stock of this quality varies greatly. Some are naturally courageous, some by nature are not. Also, to a great extent, some are afraid of one thing and some of another, thus varying largely in their bravery under different conditions. One

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man is afraid to go up in an aeroplane, another is frightened only by a submarine. Nelson is said to have been very nervous of horses. Frederick the Great fled from his first battle, and yet afterwards displayed great courage in many fights. There is nearly always a great fear of the unknown, or the unusual, which rapidly wears off when the same conditions have been experienced two or three times. Physical courage can be systematically trained and developed, like any other human quality. This is very fortunate, but it requires to be recognised and acted upon. Contempt of danger may be readily acquired, on the principle that "familiarity breeds contempt." Therefore, situations which induce fear, or present a possibility of danger, should, in reason, be frequently available. To terrify a boy of fifteen by sending him aloft to furl sail when rolling heavily is not wise or necessary. But danger in moderation, though it may increase the nervousness of 1 per cent. (at most), will rapidly harden the remainder. The young naval officer can be provided with work aloft in training ships, and work in open boats in rough weather. Boxing and Rugby football should be encouraged to the utmost, also riding and hunting whenever possible. Compulsion is not desirable, but as soon as officers understand the reason and utility of these forms of training very few would persistently abstain from them. Those that do, though possibly of high ability or intellect, are perhaps better suited for more sedentary employment; or they may develop at a later age.

Character. We proceed now to the question of character, which has been studied in all public schools, and is generally left to be evolved from those games and exercises wherein there is opportunity to display such qualities as self-reliance, self-control, good temper, etc. The chief defect, perhaps, is that the boy's co-operation is rarely enlisted by letting him know what objects we are driving at; therefore without making him self-conscious, or unduly introspective, we surely could present him with a clear outline of the qualities he has to develop. Let him know that, during the greater part of his life he will have to be engaged in a struggle for self-mastery or self-control, so that at least he can make clear headway at developing his good qualities, and eliminating his defects without external assistance.

Let him know that before he can command others he must be able to command himself. He should be able to analyse the deficiencies in his character, and state them to himself somewhat as follows:—"If I want to become a great Admiral I must correct my tendency to be lazy, I must develop more initiative and physical courage, and I must try to cultivate various other qualities which great men have conspicuously displayed."

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Confidential reports are not usually shown to the officer reported on. It is suggested that a list be made of the various qualities that are considered most important (*e.g.*, physical fitness, pluck, endurance, energy, zeal, initiative, powers of decision, command of men, etc., etc.), and that Captains and others should constantly observe the young officers under them to decide what qualities are most displayed, and what are lacked by each. At intervals of six or twelve months each young officer should be given a summary of the opinions formed about him, with hints as to how he may best eradicate his faults and make further progress. For the rest, character may be developed by the orthodox methods of games, "rugger," boxing, etc., and also by the performance of all duties which introduce self-control, co-operation with others, command of men, or an element of danger. It may be seen, therefore, that Naval duties in charge of a boat, or any detached party of men, will be entirely beneficial. Scholastic education at sea will hamper the performance of these duties, and will not aid the development of character; such education, therefore, should preferably be done on shore.

Initiative.

The quality of initiative needs a few remarks. It is said by many that peace routine and the worship of uniformity have killed initiative in our Service. Certain it is that the law of "following senior officer's motions," and the corollary "request instructions," have done harm. The mere uniformity of our routine, our clothing, and our customs, is a definite blow at that originality of thought and action which in war is priceless. Let us remember that every time we refer to printed orders, every time we "follow motions," or "request instructions," we are acting merely as machines; and battles are not to be won by machinery. Only when we think and act for ourselves; only when we resolve swiftly, and display initiative to suit the occasion, do we act like men, and rise superior to the dull level of a soulless and brainless machine.

The direct supervision of a senior officer is very apt to be detrimental when a task is being performed by a junior. We were told that German submarines did not cruise in pairs mainly because the presence of the senior would cramp the initiative of the junior. This view was very sound. Incidentally, we are not sufficiently aware that, since the days of Moltke, initiative has been constantly studied and cultivated in the German forces.

All these qualities conduce to the power of commanding men. This subject should comprise a special chapter in our "Manual of Education." It should explain the principles of discipline, the object of punishment, the alternative methods of leading men or driving

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them; the qualities specially required for command and leadership, how they may be developed, etc., etc. Three useful books which touch on this subject are "Reflections on the Art of War," by Sir Reginald Hart, V.C., "Addresses on Leadership, etc.," by Lt.-Col. R. J. Kentish, D.S.O., and "A General's Letters to his Son on obtaining his Commission." Briefly, we may say that leadership requires that an officer should inspire in his men respect and confidence, if possible affection. To achieve this in the fullest degree there are many requirements. He must be a good divisional officer; *i.e.*, he must know his men, must know something of their ambitions, hopes and troubles, and must take the utmost interest in their health and general welfare. The officer must know his own job thoroughly, so that his men can trust him never to let them down by any lack of professional knowledge. He must possess those qualities of courage, energy and determination which will ensure that if he leads his men into a tight place he will not fail to see it through with them to a successful issue. He must be prepared to share their discomforts and to set them an example in his general conduct, both as an officer and as a man, which they may recognise as worthy to be admired and imitated.

Constructive thought.

We come now to the education of the intellect. Young officers must be encouraged to *think*, to produce ideas or constructive schemes, also to criticise—first by demolishing some plan or system with destructive criticism, then building up a better system to take its place. Nearly all constructive brain work is based on the ruins of what preceded it; therefore to stifle criticism is to prevent young officers from trying to clear old rubbish from the ground to see if they can build something better in its place. Without progress the Navy stagnates. But progress is definitely held back unless criticism and constructive thinking can flourish side by side. These should be accompanied, or followed, by debate, so that criticism may be answered, new theories may be challenged, and young officers may have practice in stating their views clearly and upholding them with logical argument. Thought on abstract subjects should be encouraged to the utmost, laying stress on the great danger of becoming slaves to "material."

Gunnery and torpedo are no doubt important, but we venture to suggest that there would be infinite value (even though the Navy has never officially recognised it) in lectures, debates, or the writing of short essays, on abstract subjects such as the following:—"Discuss the main principles governing Naval discipline. In what direction does moral affect the result (*a*) of battles, (*b*) of wars? What are the predominant national characteristics (*a*) of the English

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race, (*b*) of the Germans? What particular qualities, in England, are at present unsatisfactorily developed?" etc., etc.

Imagination.

In England, imagination died with the last of the fairies. But imagination is the key-stone of constructive thinking: imagination alone can forecast and unravel the problems of the future. Only by its aid can we ward off and counter the blow that will be struck to-morrow: without it we wildly struggle to shield ourselves from the blow that fell yesterday unsuspected and unprepared for. Without imagination we are doomed to be for ever "too late."

Decision.

The power of decision, like imagination, can be developed only by a system of training which constantly exercises it. Here again we require the earnest co-operation of the student. The best results will be obtained if officers, both young and old, are constantly reminded that the power of decision will atrophy as they grow older unless they carefully study and cultivate it. Every officer must be on the look-out for occasions where a decision is needed and must take the utmost pains (*a*) to decide without waste of time, (*b*) to review mentally the various pros and cons, balance them, and then make a clear decision representing his definite opinion as to which course is best.

Even in trivial matters like "Shall I go ashore to-day?" "Is the weather good enough for golf?" etc., officers should curb the tendency to irresolution and should sternly, say "Don't wobble. Decide!"

Professional knowledge.

We come now to professional knowledge, the study of facts and the collecting of knowledge, which too often in the past had been looked on as the sum total of education. So diverse are the branches of knowledge required from time to time by the Naval officer that we must definitely abandon the attempt to make him a "jack-of-all-trades." It follows then (*a*) that to some extent he must be a specialist, (*b*) that, to cover the wide field of knowledge that he needs, his education in the different branches must be confined to essentials.

Let us start at the beginning and consider what the essentials are. First we require a youth who has had a suitable ground-work of primary education. Probably he can best be supplied by the Public Schools, for there is no object in turning over to the Naval officer work in which others have specialised and he has not. On leaving the Public School, a suitable period should be divided between Dartmouth College and the training cruisers, to pick up the elements of seamanship, navigation and naval technique generally. Thence to the fleets at sea, where, as midshipmen, they must acquire *practical* knowledge of seamanship, navigation, gunnery, ship construction torpedo work, and, to a lesser extent, marine engineering.

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Proposed curriculum.

The following ideas are tentative and subject to revision. Roughly, it is suggested that boys should leave their Public School at about fifteen or sixteen, join the Fleet after twelve or eighteen months, and then spend two and a half or three years at sea as Midshipmen and acting subs. After this they should have two periods on shore for courses, with an interval of two years in between. The first period, at the age of twenty or twenty-one would be to provide any additional scientific or technical knowledge needed to fit them for the rank of Lieutenant. The courses should be brief and should deal only with subjects that are absolutely necessary. Mathematics, dynamics, hydrostatics, and French or another foreign language should be studied. Also a small amount of navigation, gunnery, and torpedo, provided that needless mechanical details of current weapons are carefully excluded. "Pilotage" should be omitted, being reserved for officers who specialise later on in navigation. In its place Sub-Lieutenants, during some part of their courses, should attend at the War College for a series of lectures on subjects such as Discipline, Leadership, *Moral*, Duties of a Divisional Officer, the Development of Character, etc., etc. In these subjects there should be no examination. The main object of the courses would be to fit them for performing the duties of a Lieutenant at sea, as Officer of the Watch, Battery Officer, Turret Officer, Divisional Officer, etc., etc. Officers who intend to specialise in engineering should branch off at the age of twenty or twenty-one, and start a course of instruction at Keyham or elsewhere.

In view of the fact that their work at sea will keep them below, where they cannot take part in exercises of seamanship nor observe the handling of ships and squadrons, except in rare cases, specialist engineer officers should never revert to upper deck duties; but this should be permissible in special cases with Admiralty approval.

The total duration of the Sub-Lieutenant's courses would be about six months. On conclusion each officer should be given at least a month's leave, extra full-pay leave up to a total of two or three months being given as a reward for meritorious examinations.

It is considered most important at this age, after a certain amount of brain work, that a short rest should be provided before resuming service afloat. At times, particularly later on, it is most beneficial to get right away from the Navy, and have time to forget it. It is, therefore, strongly recommended that at intervals of five or six years all officers who have been continuously employed, particularly those that are intellectually inclined, or have had a lot of brain work, should be enabled to get away for three or six months' half-pay leave.

Many, perhaps, would not wish to take so much, but it should be

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quite possible to spare those that do, except in times of unusual stress. It is a grave mistake to suppose that officers should continually be kept with their noses to the grindstone. It was not done in the past, whether we refer to the days of Nelson or right back to the Greeks and Romans, nor is it necessary now. To get away for a time enlarges one's horizon, sharpens the intellect, and averts the danger of settling down to spend a whole lifetime in one narrow groove.

Sea training.

On completing their leave after the courses, the subs. should proceed to sea until they have got two years' seniority as Lieutenants (or a total not exceeding three years since they finished their courses). During this time they should be given every opportunity of practising the handling of men and studying discipline, leadership, etc. They should also be encouraged in every possible way to develop character and initiative. Their success will largely depend on how they are trained by the officers they serve under. In their spare time they should devote themselves to preparing for the specialist and other duties that they will take up later on. This may be done by reading history, text books or manuals on strategy, tactics and the art of war, or (occasionally) text books of scientific and technical subjects.

Specialism.

After their two or three years at sea (as requisite for getting two years' seniority as Lieutenant) officers would be eligible to go ashore to specialise, at the age of twenty-two and a half to twenty-five.

Engineering has already been dealt with; there remain :—

a.	*b.*	*c.*
Gunnery	Submarines	War Staff
Torpedo	Destroyers	
Navigation	Physical Training	
	Signals	

We should also add the "salt horse" profession for officers who do not specialise.

These various branches are very diverse; they require different training both in quality and quantity, and, at present, they stamp the various specialists as something quite different from their fellows. Actually, on careful analysis, the difference is much greater than appears on the surface. This is quite wrong. An Admiral who has been a Gunnery Lieutenant should look at the big problems of war in exactly the same way as an Admiral who has been a submarine or signal officer. What we require, therefore, is to co-ordinate the training of all specialist officers, and to make it clear that specialisation is a means to an end and not an end in itself. This work must be done by the Admiralty Training Section.

The first requirement is the construction of manuals, either at the

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Gunnery. War College or Admiralty, by the best brains the Navy can produce. These manuals should cover concisely and clearly such subjects as strategy and operations, tactics and staff work, the objects of technical training, functions of different types of warships, uses of the different weapons in battle, principles of fleet and squadron training, etc., etc. A good deal of the above would be contained in our "Manual of Education and Training," so that two more would cover all the ground. Thus, co-ordinated at the fountain-head, our specialist courses would all be working towards a common end, and all be guided by the same fundamental principles. Gunnery would no longer be (as before the war) the science of enabling individual ships to make a maximum percentage of hits on a slab of canvas with a limited number of rounds. It would become a science closely allied to tactics, for the purpose of enabling an Admiral in battle to destroy by gunfire, in a minimum of time, any selected portion of the enemy's forces opposed to him. The gunner, therefore, would be the servant of the tactician, and would never attempt to become his master. To return to our courses; it is proposed that the War College should exercise a guiding hand, pointing out to all the ultimate goal to be aimed at. A "long course" should commence annually for training officers in staff duties, and to qualify for "War Staff." There should also be periodical short courses (taking two or three months) to enable large numbers of officers to gain an elementary knowledge of the principles of strategy and tactics. They would be taught why we study history, and how to study it, also what books to read for the purpose of self-education in the art of war, a printed list of books being issued to every student.

Besides lectures on strategy and tactics there should be a few to explain what qualities of character, intellect, etc., it is particularly necessary for Naval officers to develop, and what steps can be taken by the individual officer to develop them.

Short courses. These short courses should be attended by as many Lieutenants as possible, and should be compulsory for all who can spare the time. The only officers to be excluded would possibly be those whose qualifying "long course" takes more than eight months—*i.e.*, chiefly the Gunnery and Torpedo Officers. In their case it might be preferable for them to go to sea as soon as their long course is completed, attending for their short course at the War College a year or two later. The "W.S." long-course qualifiers would naturally not need to do the short course. All other specialists should do the War College short course immediately before or after any other qualifying course they take. They should not, however, be ashore more than a total of ten or eleven months. "Salt horse" and destroyer officers

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would come in when convenient, usually at the end of a commission or when leaving a sea-going ship.

By this means every officer who may ultimately have to command a ship or squadron in war will have opportunity in his younger days to make a start at those subjects which really are more important than any other part of our professional knowledge. Thus we should conform to Lord Wolseley's opinion on the needs of the Army:—"Any system of education which confines its study of strategy to a limited few is an insult to the intelligence of our officers and a danger to the State."

Naturally, a short course will teach very little, but it should suffice to indicate three things: The extreme importance of studying all branches of the art of war, the extreme complexity of the subject, and the need for individual study and reflection lasting over a number of years before it can be mastered. In this subject, more than any other, "a little knowledge is a dangerous thing." We start by picking up a few general principles, and we then exclaim, "Why, these are so simple that they are mere platitudes!" Strategy.

Actually, their apparent simplicity is the cause of innumerable pitfalls in applying them correctly. After long study and reflection we find that sometimes they appear to conflict with one another; very often in practice there may be only one reason for adhering to a principle and a hundred arguments for violating it (as for example in those cases which lead to a dangerous dispersion of forces). Thus we find, in practice, that there are 100 officers who know the main principles of war for every one who understands how to apply them correctly, and really endeavours to do so. More and more we find that the apparently simple is infinitely difficult. Finally, we discover that the subject is practically inexhaustible, and the more we learn about it the more there is yet to be known.

The reason is, of course, that strategy is not merely a series of geometric problems in time and space; it is actually a series of moves in a hazardous and complex game, wherein we sit blindfolded to pit our wits against all the intellect and cunning of a rival nation. Each move in itself, though fraught perhaps with tremendous consequences, may be as simple as pulling the trigger of a gun. But this is the paradox of war.

Every move is psychological as well as dynamic, for we move, not only to achieve the clash of armed forces, but also to influence the *moral* of the participants, to mystify and mislead the opposing high command, and to germinate slowly in the minds of the enemy people a terror of ultimate defeat.

The "W.S." long course would correspond to the Staff College

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"W.S." long course.

course at Camberley for military officers. It should be completed in twelve months, if possible, but experience may indicate that this is not long enough.

The course should be open not only to officers at the usual qualifying age, but also to any who can obtain selection up to the age of thirty-two. Thus Lieutenants G. and T., or young Commanders, could take the course if specially recommended. Selection would be made partly by means of a competitive essay to be written by the candidates, partly from recommendations, and to some extent by taking the most promising students who have attended a War College short course.

It is highly desirable that the best brains in the Navy should find opportunity to attend either a short or a long course. The object of the course would be to train officers for filling War Staff appointments at sea, in war or peace, and billets in the Admiralty Naval Staff. The training would aim, therefore, at producing a considerable number of competent staff officers, whilst simultaneously presenting that class of professional knowledge which would be of special value to any officer who subsequently rises to Flag rank.

It should be clearly understood that the "W.S." course, though highly desirable for a Staff Officer, should in no way be considered indispensable for high command. Naturally we hope that the course would be of great advantage, but there must be no "War College" clique, and the final selection for commands must depend only on ability and fitness irrespective of early education. The "W.S." long course can only be described here with the utmost brevity. Suffice it to say that the following important branches of the Art of War must receive careful attention :—

> Naval history, Elements of strategy, Operations of war and the principles governing them; Attack and Defence of Commerce, Blockade, Naval and Military combined operations Oversea expeditions, Defence against invasion, Naval bases Colonial and Imperial strategy, Staff work, Organisation, Orders and instructions; principles of Command, ashore and afloat; Admiralty organisation; Tactics in all its branches; Types of warships and their different functions; Naval weapons, their possibilities and limitations; Aircraft and air strategy; National policy in peace and war; Preparations for war; Co-ordination of all departments in war, particularly the Foreign Office, War Office, Admiralty, etc.

Professional debates.

Periodical debates should be arranged to discuss all controversial subjects and current professional problems. In addition to these clear and more or less concrete matters, it is essential that some

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attention should be given to those abstract and intangible factors which the average Englishman has a morbid dread of.

The abstract and the real.

Any abstract thing, such as imagination or initiative, is generally considered too "immaterial" to be worthy of serious consideration; but this is one of the worst mistakes in the whole history of our race. To a large extent the Englishman dislikes these subjects because he thinks them intangible and difficult. Actually, no study is difficult if we go at it slowly and in the right way. There certainly are abstract studies, such as philosophy and theology, which are comparatively difficult, but those subjects which the Naval Officer requires to study are really simple and restful compared to the higher mathematics, spherical trigonometry, etc., that we have had to wrestle with in the past.

National characteristics.

The first thing, then, for us to study is the national characteristics of the British people; observing in what particular qualities we excel, and in what we fall short of the standard reached by neighbouring nations. If it were possible to present the results graphically, with a black-and-white record for each nation of Europe, the difference in the various records would be truly astonishing. Unfortunately, we can only make a very rough estimation, and experts will differ about the details, but all will at least agree that the study of certain abstract factors is of vital importance to those men who are ultimately to form "the brains of the Navy."

The amount and the direction of the study may vary according to individual taste, but it should be the duty of the War College to provide, to those who desire them, facilities for the study of such subjects as:—Discipline, *moral*, patriotism and other ideals, imagination, initiative, development of character, development of intellectual qualities, principles of education, etc. If we omit these factors we run grave risk of making our education incomplete, and thus of failing to obtain the best results, not only from one but from many successive generations.

By making these subjects available we ensure that they will be studied at least by a few who have aptitude in that direction; we ensure that the scope of our education will not be narrower or less complete than that which is available abroad, and we then may reasonably hope that in future wars even the most subtle and cunning of foreign General Staffs will fail to outwit the British Naval Officer.

Human nature.

To those who deride the study of all abstract subjects we would point out that, when we speak of such a thing as psychology (which perhaps sounds more difficult than the others), we mean nothing more than a study of human nature and the mind of man. Man,

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after all, is a species of machine, but a very complex one. The conception of every plan, and the control of every action, is centred absolutely in his mind, so that here alone we can find the key to all his conduct. If we neglect to study this key we are taking a risk exactly comparable to that of a man who sets out in an aeroplane for a long distance flight over enemy country, and is completely ignorant of the machinery that his life depends on.

We must never forget that "it is not ships that fight, but men." Therefore, the more we can learn about mankind and our fellow-man, the better we shall know how to fight him successfully on land and sea.

Conclusion.

The aim of this paper has been to sketch an outline of our subject, and to suggest ideas and principles. The filling in of details must come at a later stage, when the foundations of our educational system have been well and truly laid. At present, our young officers are trained in a house which, as all the world may see, is builded upon very shifting sand.

We desire, then, to emphasize that our scheme of education must be complete, both as to breadth and length. For the latter, it must not be content to stop at the Lieutenant or the Commander, but must envisage the officer's whole career, and must pay due regard to the vital importance of the duties performed by the higher ranks.

It may be thought that we advocate too much attention to abstract studies, and too little to the demands of the material and technical sciences; but this is not so. The latter are manifestly important, though we think that excessive concentration on them has caused grave neglect of the other subjects. We do not wish, however, to fly to the other extreme. A fair balance is essential, and we must consider very carefully the different interests we have to balance.

Roughly, they are these:—

Intellect on the one hand; character on the other.

Theory on the one hand; practice on the other.

Moral on the one hand; *matériel* on the other.

In England, to a great extent, it has been the custom to worship one factor and despise the other. This certainly was bad, but even worse was the common fallacy that each was antagonistic to the other. One often has heard the officer who prides himself on being "practical" speaking derisively of the "theorist," while the officer alleged to be too theoretical asserts loudly that his critic is not nearly so practical as he thinks he is.

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Theory and practice.

Certainly in England we have worshipped character, practical work, and *matériel*. Nor were we unwise to do so, but we must realise that there are also other matters of great importance, and all should blend harmoniously in our scheme of training. Far from being antagonistic, we shall find that each will help the others to attain their fullest development. Theory is useless without practice practice is very inferior without theory, for each is the complement of the other. Similarly, character without intellect, or constant study of *matériel*, and neglect of moral factors, will not produce the highest efficiency. They may achieve much, but they are not good enough for modern war. In the war just concluded there was nothing we could dare to neglect without jeopardising our chances of success; in the wars of the future this will be the case still more.

Naturally some men are born to command, and some are only brilliant thinkers; but here also we must make full use of both. If all the desired qualities cannot be combined in one man (which is almost impossible) we must combine the men in suitable groups. We can then combine character and intellect by a carefully selected Command and Staff, who, working in close co-operation, will produce better results than any single man can hope to achieve.

In exactly the same way, then, the Command and the Staff are complementary, and each is vital to the success of the other. Unfortunately, it happens too often that the officer who commands will choose to serve under him Staff Officers who are similar in character and temperament to himself. This is fatal, for the Staff will then inevitably lack the same qualities that are lacking in the leader.

Complexity of war.

Enough has been said to show that war is a matter of infinite complexity. Every phase of it, in its right place and in right proportion, must be represented in our scheme of education and training. The non-essential should generally be omitted, and it must be clearly recognised that we have to determine what the naval officer should be, besides merely what he must know. Many factors influence the final result; heredity is the only one that is not under our direct control.

To conclude with one word in favour of the abstract subjects, let us consider what answer we should receive if we asked an Admiral or Captain what type of officer he would like to select for his First Lieutenant or Commander. Would he say "Give me an officer who knows this much algebra, this much dynamics, so much nautical astronomy, etc."? Surely he would be more likely to say "I want a man who understands discipline and the handling of men, whom the ship's company will respect and readily obey—a man who will display cheerfulness, energy and self-reliance in any emergency, with

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ample initiative and determination, and with character and intellect equally developed."

The great aim of Naval education.

This, then, in addition to professional knowledge, is what we ought to aim at. If we look higher and ask: "What type of man do we require to lead our fleets and squadrons into battle," we see that the abstract qualities become even more important. Physical courage, initiative, determination, and powers of rapid decision are essential. To this must be added a thorough knowledge of strategy, tactics, and the whole art of war. Technical knowledge, mathematics, even science (which Herbert Spencer so strongly emphasised) are entirely subordinate to the above requirements. Even on the intellectual side, which is very important, technique and the sciences are but a branch of the total training needed to produce the best results.

Somehow the old system seems to be rather aptly summed up by the last lines of some verses written many years ago by one of the subs. at Greenwich:—

> "Oh ye fools who made the system, where's the sense and what the gain,
> May not all this dreary learning dull the eye and cloud the brain?
> When the day of Armageddon dawns upon the Eastern sky
> Shall we win by permutations, will dynamics help us die?"

The policy advocated in this paper might take five years to get properly started and some ten years to bear fruit. But no one who has closely studied the history of the recent war can deny that changes on these lines are urgently desirable.

To refrain from such changes would be more than deplorable; it would hold back the Navy from attaining the uttermost degree of efficiency, and would render possible in future years defects or dangers that might imperil the existence of our Empire.

R. P. Ernle Erle Drax.

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CHAPTER XI.

Naval Pay and Welfare Conditions.

Since the signing of the Armistice, matters of naval pay have loomed largely in the public eye. Under the heading of naval pay come all the domestic problems of the naval life, the wages, the victualling, the clothing, the "household" conditions on board ship, the pension, and half-pay. The men have summed it up in what they call the welfare conditions of the Navy. There is a spirit of unrest abroad in the Navy as elsewhere; but it is likely that before very long conditions in the Sea Service will be adjusted to the needs of the times.

Two establishments—the ship and the home.

The granting of adequate rates of pay to officers and men is necessary in all ranks. No doubt there is good value given to officers and men on board ship in kind, but these things are chiefly connected with the "living in" conditions on board ship, and are distinct from the home life. It is no longer a question whether the Service should be manned by bachelors or married men; this is a subject for academic discussion in the ward rooms; everyone is asking for the rate of pay which is required by the married man to keep up a home in accordance with the social conditions in civil life. An officer in a ward-room mess obtains satisfactory "living in" conditions, and in co-operation with his brother officers can live cheaply. But if he is to be attached to a home life, all this outlay on his part is for the support of a second establishment. His primary concern being his home, he bears the additional ship expenses with an ill grace when, as at present, he is not paid well enough to support both the home and the ship life.

The expenses of keeping up a ward-room mess may be said to be approximately £100 a year, but, in addition to this, there are certain expenses ashore which are necessary, in the absence of the home life, to drive away the monotony of existence. Officers in destroyers, and in submarines in Home waters, are more in touch with the home life than officers serving in the larger vessels. Their mess expenses are also lighter. To add to the expenses of the naval officer, one must bear in mind the uniform. Before the war, expenditure on this outlay was anything between £20 to £30 a year for renewal only, after a complete uniform had been obtained. Now the cost would be almost double. The Admiralty grant compensation to officers of Lieutenant's rank who lose their effects on service to

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the limit of £152 for uniform and appointments, and £37 for linen, and the probable expense of the first outfit can thus be estimated.* Also, there are the railway expenses, and the moving expenses connected with the constant change of home, due to change of ship and the ship's movements.

The rates of pay of officers are fixed on a low scale, and concessions are granted which affect different people differently, such as income tax rebate, allowance for uniform in assessing income tax, children's allowance of £2 a month up to four children for Lieutenants, etc. Also, officers qualify for different duties, which leads to extra pay and allowances. I have thought it best to take the case of the Lieutenants, as the Executive Officers are, on the whole, age for age, the best paid officers in the Navy. There is a call for simplification and standardisation of rates of pay, with the abolition of concessions, but it is questionable whether any wholesale alteration of the present system is contemplated by the authorities.

Pay of officers.

To take the case of a Lieutenant. Prior to the recent grant of the bonus, his pay commenced at 12s. per day (£219 per year) at the age, say, of twenty-two, and at twenty-six he received 13s. 6*d*. (£246 7*s*. 6*d*. per year) until he was thirty. During the latter four years, however, he might reasonably expect to receive extra remuneration on having qualified as a specialist in navigation, gunnery, torpedo, engineering, signals, etc., at rates from 2s. 6d. to 5s. a day. Also destroyer officers about this seniority would receive command money of 3s. 9d. a day, and hard-lying money of 1s. 6d. a day is paid to all destroyer officers. Submarine officers are specially paid at an additional rate of pay of 6s. a day, besides command money when in a command. A Lieutenant thus, say, at the average age of twenty-eight, might be receiving—

Specialist.	Pay per Day.	Allowances.	Total. Per Day.	Total. Per Year.
	s. d.	s. d.	s. d.	£ s. d.
Navigation	13 6	4 0 or 3 0	17 6 or 16 6	319 7 6 or 301 2 6
Gunnery	13 6	4 0 or 3 0	17 6 or 16 6	319 7 6 or 301 2 6
Torpedo	13 6	4 0 or 3 0	17 6 or 16 6	319 7 6 or 301 2 6
Engineering	13 6	5 0 or 4 0	18 6 or 17 6	337 12 6 or 319 7 6
Signals	13 6	4 0 or 3 0	17 6 or 16 6	319 7 6 or 301 2 6
Physical Training	13 6	2 6	16 0	292 0 0

* The higher the rank, of course, the greater the expenditure on gold lace.

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Specialist.	Pay per Day.	Allowances.	Total. Per Day.	Total. Per Year.
	s. d.	s. d.	s. d.	£ s. d.
Destroyers	13 6	Command: 3 9; Hard-lying: 1 6	18 9	342 3 9
Submarines	13 6	Command: 3 9; Submarine Pay: 6 0	23 3	424 6 3
Senior Lieut. in 1st class ship	13 6	1 6	15 0	273 15 0
Seniors in others	13 6	2 6	16 0	292 0 0

Many Lieutenants, however, would receive the bare pay only.

Officers of the other branches of the Service about the age of twenty-eight received prior to the bonus :—

Specialists.	Pay per day.	Allowances.	Total. per day.	Total. per year.
	s. d.	s. d.	s. d.	£ s. d.
Engineering (Senior) old system	13 0	2 6	15 6	282 17 6
Engineering (in Destroyers)	13 0	Charge of Engines 3 0; Hard Lying 1 6	17 6	319 7 6
Medical	17 0		17 0	310 5 0
Paymaster*	13 0	If in Charge 2 6	15 6	282 17 6
Naval Instructor	12 0		12 0	219 0 0
Chaplain	12 0		12 0	219 0 0

It is necessary to add that it is difficult to say exactly what standard rates of pay are received by officers, as the war conditions have upset all the old ones. Officers will, in all probability, be receiving extra allowances at a later age after the war. The officers of all classes are, all things considered, best off for pay about the age of twenty-eight.

Commanders receive pay at 23s. a day. Officers of other branches of relative rank in some cases receive the same pay, and sometimes more, but in all cases these officers are promoted to this rank at a much later age than the Executive Officers. If one notes the pay of the latter, the rate of naval pay can be considered, under its most favourable aspect, as in the case of the Lieutenants.

* Receives extra pay if Secretary.

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Half-pay.

When an officer has attained a certain seniority he is liable to be placed on half-pay. There was very little half-pay in the working up times prior to the war, as the Navy was expanding to meet the ever-growing menace in the North Sea, and every officer was needed. But in the nineties it was recognised that half-pay was part of the lot and existence of the naval officer, and was to be more or less expected between appointments, Junior Post Captains, for example, unless specially fortunate, had to look forward to any period up to two years before getting a ship. It was something less than half-pay they were receiving, because the officer on shore is without his home on board ship; his rations, his servants, etc. For officers continuing to be of ward-room rank, the conditions are even harder, because they give up the mess life, where, in co-operation with brother officers, the living is, comparatively speaking, economical.

The defects of half-pay.

Half-pay is an important instrument of administration, and is sometimes used as an act of discipline against an officer. If an officer does not desire to accept an appointment offered him, for example, he is given the option of going on half-pay. The system of half-pay provides an active reserve of officers, but it is at the expense of the officers. Half-pay is a retaining fee. For those officers who are able to live comfortably on shore on their own means it has manifest advantages. They can wait upon appointments, and obtain a welcome and a much-needed rest from the disciplined naval life. But the poor officer can never be in a position to exercise this choice, and half-pay, in consequence, is a real terror to him.

Half-pay nowadays is regarded with little favour in the Service, except when it is taken at the option of the officer. Naval opinion is against compulsory half-pay, except as a punishment. An active reserve of officers, however, being necessary to the State, if half-pay is to be avoided there must be employment for them, and the employment must be out of the ordinary. Everything seems to point to an extension of the system of courses for officers, a system which was developing so much in the years just preceding the war. The exacting requirements of the naval officer's profession in all its branches are such that revision and extension courses are in favour with the authorities. It is recognised that changes come on rapidly in these days, and also that it is difficult to keep abreast of the times, let alone the training of the mind to be able to look ahead. In addition to the development of the system of courses for officers, as more leave is now to be granted after foreign service, some of these periods which were formerly spent by officers on half-pay would now be absorbed. Also in certain appointments, officers under certain conditions cannot take their leave at all unless substitutes

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are found. Obviously necessary in some cases, such as medical officers, it is probably highly desirable in many others. The system of substitutes in special cases, so that officers can proceed on leave would benefit the Service, and not throw double work on those who remain behind.

The annual rates of full and half pay for certain classes of officers are as follows :—

Scales of half-pay.

	Full-Pay.		Half-Pay.	
	From.	To.	From.	To.
Captain, R.N., from age 39 to 50 . . . . . (Plus Command Money).	£428	£602	£292	£365
Commander, from age 33	419		182	209
Engineer Commander, from about age 39 to 50. (Plus Charge.)	438	602	255	328
Surgeon Commander, from about age 39 to 52 . (Plus Charge in certain	492	638	255	365
	cases only.)			
Paymaster Commander, from age 39 to 55 . . (Plus Charge in certain	401	602	191	301
	cases only.)			

Pay of men.

Let us now consider the pay of the able seaman, a man about the age of twenty-four. He would receive the daily pay of his rating, 2s. 1d., and would probably have qualified in gunnery, or torpedo, to receive additional pay of 3d. a day, and by the possession of a good conduct badge, 1d., making in all 2s. 5d., or 17s. 11d. a week. If married (and no children) separation allowance* would be paid at the rate of 6s. a week, with additional allotment concession of 3s. 6d. a week, making in all 9s. 6d. a week. The weekly pay he and his wife would thus dispose of would be 27s. 5d. Until recently he was accustomed to put, on an average, 1s. 6d. a week into his messing bill, to supplement the Government victualling. This outlay has been obviated now by the grant of an increase in the messing allowance of 3d. a day per man, of which more anon.

Separation and kit upkeep allowances—war concessions.

The able seaman since 1917 has had little or no charge on his pay for the uniform. He has received the gratuitous issue of clothing, which includes every article of his kit and which values out at approximately £15. But since 1917 only has he received a kit upkeep allowance. This, like the separation allowance, was a war concession, but had been often asked for by the men in pre-war times. The Government continue to issue all clothing at a nominal price only, and these prices are extremely low ones. A suit would cost the able seaman, 6 yards of serge at 1s. 6d. a yard, 9s., making up by another seaman on board ship (and here is remunerative

* There is another concession of 6s. 6d. a week to wives of seamen, without children, who are "not working for wages," after recommendation by a *Local War Pensions Committee!* It is paid by the Ministry of Pensions. An extraordinary concession.

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private work for certain men always at hand) would cost 6*s.* and 9*d.* for the materials, badges with sewing on, 5*d.*, costing in all, 16*s.* 2*d.* The suits are issued also ready made in all sizes for 12*s.* 10*d.* Some men in shore establishments do not trouble to have suits made for them, but avail themselves of the opportunity of buying them ready made; but men in ships much prefer their suits being made to measure so as to look smarter. The blue jean collar costs 1*s.* 6*d.*, the cap 2*s.* 2*d.*, black silk handkerchief 3*s.*, the good stout boots 13*s.* 5*d.*, and flannel vest 4*s.* The jumper and trousers after wear become the night clothing suits. For white working rig duck is used, at 1*s.* a yard, and the suits costs about 10*s.* when made to measure, and 8*s.* 1*d.* if selected from the government stocks.

An estimate can be formed of how far the kit upkeep allowance will go. As regards the men dressed as seamen (kit upkeep allowance of £5 10*s.* a year) here are some articles of clothing, with the cost shown :—

	A Measured. £ *s.* *d.*	B Ready Made. £ *s.* *d.*
2 Serge Suits	1 12 4	1 5 8
1 Duck Suit	0 10 0	0 8 1
2 Caps	0 4 4	
2 Collars	0 3 0	
1 Black Silk Handkerchief	0 3 0	
1 Pair Boots	0 13 5	
2 Flannels	0 8 0	
2 Pairs Drawers	0 4 8	
1 Pair Shoes	0 11 1	
6 Pairs Socks	0 5 6	
3 Pairs Stockings	0 3 6	
	£4 18 10	

The tailoring for those men who wear the fore and aft uniform is chiefly executed under a contract between the Admiralty and tailoring firms, and the cost to the men would be approximately as follows :—

Class I (Chief Petty Officers).	£ *s.* *d.*	Class III (Fore and Aft Rig).	£ *s.* *d.*
Cloth Suit or Diagonal Serge	2 6 11	Cloth Suit or Diagonal Serge	2 4 4
Serge Suit	1 3 9	Serge Suit	1 1 5
Tartan Suit	1 18 2	Tartan Suit	1 15 7

The rates of the kit upkeep allowances are fair ones, but, of course, these always must be based on the issuing prices of the clothing. The allowances for the different classes are :—

	Per Annum. £ *s.* *d.*
Class I (Chief Petty Officers)	7 0 0
Class II (Men dressed as Seamen)	5 10 0
Class III (Men not dressed as Seamen)	6 0 0

Extra pay. The men, in addition to their rates of pay, are able to earn extra pay for certain work done. Work outside one's own ship is

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generally paid for; work in "double bottoms" is paid for at the rate of 9*d.* a day in Home waters. Steaming pay is allowed in the tropics. Hard-lying money is paid for service in destroyers at the following rates:—Petty officers 1*s.* 3*d.*, able seamen and stokers 1*s.*, etc. Climatic pay in exceptional circumstances is paid at 6*d.* a day to the ship's company. Divers are paid for their special work. Prizes for good shooting with the heavy, light, and other guns, are allowed to seamen and marines, and also for rifle and pistol shooting. Submarine service gains extra pay as in the case of the officers.

Review of conditions of men's pay.

Like the officers, the seamen, with concessions granted from time to time, are well enough off in their ship life, but when it has come to the question of supporting a home life as well, they are equally at a disadvantage in comparison with their opposite numbers in civil life. We have also to consider again all those railway expenses of the week-end leave when, say, the ship is at Portland and the home at Portsmouth, Devonport, or Chatham. With the increased cost of living the young married seaman is very badly off, notwithstanding the concessions. Prior to the war, the able seaman, without the separation allowance, the kit upkeep allowance, both war concessions, had a net cash clearance for his home life of not more than 10*s.* a week. A Chief Petty Officer is, of course, better off, but he has more to keep up. His weekly pay, inclusive of non-substantive pay (without the bonus), will vary from 32*s.* 2*d.* to 46*s.* 8*d.* maximum; adding the separation allowance of 8*s.* (without children—one child would obtain 4*s.* extra) allotment concession 3*s.* 6*d.*, making in all say 50*s.* a week on the average.

The more one looks into the details of the pay of the seaman, and considers the concessions which have been added thereto, with the numerous variations and exceptions, the more one realises how difficult it is to say exactly what the actual average income of the seaman is. But it is evident that the rates of pay, originally too low, have been too rigidly adhered to. The Government have endeavoured to meet each new call and representation by a system of doles and grants. Many consider that it would have been preferable had the flat rate of pay been increased from time to time to cover the requirements as has been done throughout the war in the labour world, without setting up the principle of State aid to the wives and dependents of the men as a separate charge.

How due and paid.

Navy pay and wages are due quarterly only under some old regulation. This quarterly settlement must have been a great reform in its day as replacing the end of the commission settlement. It may be the time has now arrived to bring in a weekly pay system.

In the Navy no one signs a receipt for his pay. The payments

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are made on a system of witnessing and of personal identity. This is easily carried out on board ship, where all make up one large family, so to speak, but with difficulty only in depôts, barracks, etc., as there are so many changes. An Executive Officer and a representative of the ship's police are required to be present at each payment.

Pensions of officers.

The pensions that can be obtained by the various ranks are as follows :—

Admirals	£950	
Vice-Admirals	800	
Rear-Admirals	650	
Captains	600	Age 55
Commanders	400	Age 50
Lieut.-Commanders	300	Age 45

Engineer Commanders obtain their maximum of retirement of £450 at the age of fifty, while Paymaster Commanders have to serve until fifty-five. The maximum pension of Engineer Captains is £550, and of Paymaster Captains £500. Chaplains and Naval Instructor Commanders receive as maximum £400. Medical officers have special rates which do not, however, differ materially from the others. A medical officer has the privilege of retiring on £1 a day after twenty years' service. This was looked upon as a valuable boon, but it has lost much of its attraction owing to the lower purchasing power of money. Also it must be remembered that the medical officers enter the service about the age of twenty-four.

Pensions of men.

The pensions which can be gained by the man are :—An able seaman, stoker, etc., not advanced, a rare case, with three badges and a good conduct medal, would receive £22 16*s.* 3*d.* A chief petty officer, on the other hand, can gain as much as £55 in certain classes, but in others would not amount to more than about £50. The amount in all cases depends upon early advancement to Petty Officer. These are the pensions of ratings who do not get promoted to Warrant Officer, but in these days so many opportunities are open for promotion that the pension is, in so many cases, rather in the nature of an alternative choice. The pensions of the Warrant Officers show a considerable increase on those of Chief Petty Officers, and the limit is fixed at £150 a year. Many Warrant Officers eventually become Lieutenants and receive the higher rate of pension. The pensions of the seamen are gained at the age of forty.

Pension as deferred pay.

Within recent years both officers and men have endeavoured to obtain an alteration in the character of the pension. It is likely that the principle that pension is nothing else but deferred pay has now been accepted by the authorities. How this will be translated into action remains to be seen. In the Australian Navy, the very description—pension—has disappeared. A certain amount of a

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man's pay is deducted and credited as deferred pay. This deferred pay is so much the property of the man that, even in the case of a deserter it was decided in the Law Courts in Australia that the accumulated sum had to be paid over to the man.

It seems likely that in the old country there will be a compromise between our system and that in force in the Australian Navy. The pension will, at any rate, become a more tangible thing than it now is. Its payment will probably be extended to the widows of seamen. In the case of the decease of the retired officer or pensioner seaman a goodly proportion of the pension will probably be paid to the widow and so on to the children, under some form of trust, until the latter are started in life. It would be fair also that the next-of-kin of an unmarried man should receive a grant in certain cases, such as early decease. Money has been earned in every case. It would probably be better to fix scales of deferred pay, applicable to one and all, and give the option to the officer and man, married or single, to draw out a capital sum, or take the money in the form of an annuity. But this is an open question still. It would be advisable if the services of the Public Trustee were made available in the cases of widows and next-of-kin.

The rates of the pensions, even as the rates of pay, are likely to be increased. One hopes that, for purposes of taxation, the pension will always be treated as earned and not as unearned income. It is the question once again of the pension being recognised officially as deferred pay and not as a compassionate allowance. It would be a graceful concession, also, to increase the rates of the pensions already being received by naval officers and men, as the conditions of living have altered so considerably since the present rates were fixed.

Victualling.

The absence of any serious defect in the victualling in the Navy should be noted. There has been delay in increasing the rate of messing allowance as the need has grown from time to time with the increased prices, and it is probable that if the Victualling Department at the Admiralty had embarked on the canteen business on its own, instead of farming it out first to contractors and then to the semi-official Navy and Army Canteen Board, this section of the food arrangements would have been more efficient than it actually has been. All the official machinery was ready at the Admiralty, save the Naval officers and men, and the depôts, storehouses, and the transports were available, but the semi-official system was preferred.

Standard ration.

The system of victualling in the Navy is as follows:—Officers and men, from admiral to boy, are issued a daily standard ration and are granted a messing allowance of so many pence per day, with which

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to supplement it. The standard ration is as follows, and the approximate market prices (January, 1919) are shown:—

JANUARY, 1919. STANDARD RATION FOR SEA-GOING SHIPS AND ITS VALUE AT MARKET PRICES ON SHORE.

				s.	d.			Value Pence.
10	ozs.	Bread	at	0	2½	per lb.		1·40
8	„	Fresh Meat	„	1	10	„		11·00
16	„	Fresh Vegetables ...	„	0	1½	„		1·50
2	„	Sugar	„	0	7½	„		0·93
½	„	Tea	„	2	8	„		1·00
½	„	Chocolate	„	3	2	„		1·18
¾	„	Milk, unsweetened ...	„	0	11½	per tin		0·71
1	„	Jam	„	0	11¼	per lb.		0·70
4	„	Preserved Meat (on one day a week in harbour and two days at sea.) ...	„	1	11	„		1·17
		Condiments (mustard, pepper, salt and vinegar. supplied as required)				... ...	approx.	0·50
		Total				... ...		20·09

This valuation of the standard ration is, of course, an underestimate, as the cost of the heating for cooking purposes and of the preparation of the food for the table is not included. Who can value the tot of rum? It was worth in pre-war days, say, 6*d.*, and is now worth about 1*s.* 9*d.*, while the Admiralty rebate is slightly over ½d. only. It would be interesting to see the official balance-sheet of the spirit ration; the rebate seems based neither on the principle of economy nor on that of temperance.

The standard ration is issued to the various messes on board ship, who either prepare the dishes themselves or have them prepared by the ship's cooks, prior to the actual cooking. It is purely optional on the part of the men. In depôts the ration and messing allowance are compounded, and a general mess is formed, which is administered by a Paymaster Commander. The actual messing is about the same, but the men have no accounts to keep; on the other hand, the men have no control.

Messing allowance.

The messing allowance stood at 4*d.* in August, 1914, and has increased from time to time in consequence of representations from the Fleet, until in December, 1918, it was fixed at 10*d.*, with a final increase of 3*d.* a day. The messing allowance is expended by officers and men as they please in the purchase of provisions from the Government stocks on board ship or from the canteen. The prices of the provisions, which can be purchased from the Paymaster, are as follows, and, like the clothing issue prices, are purely nominal, owing to the monetary standard having been adopted:—

Prices of provisions on board.

		s.	d.			s.	d.
Beans, Haricot ...	per lb.	0	1¾	Chocolate	per lb.	0	1½
Bread	„	0	1¼	Flour	„	0	8½

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		s.	d.			s.	d.
Marmalade ...	per lb.	0	3	Coffee	per lb.	1	2½
Milk, Fresh ...	per gall.	1	11	Jam	„	0	4
Milk, unswt'd ...	12 oz. tin	0	4	Fresh Meat ...	„	0	6
Oatmeal	per lb.	0	1½	Pres'd Meat ...	„	0	7½
Pepper	„	0	10	Mustard	„	0	8
Pickles	„	0	4	Marrowfat Peas ...	„	0	2½
Potatoes	„	0	0½	Split Peas... ...	„	0	1½
Raisins	„	0	4	Salt Pork... ...	„	0	9
Salmon	„	0	7	Rabbit, tinned ...	„	0	4½
Suet, refined ...	„	0	7½	Rice	„	0	2
Tea... ...	„	0	9½	Salt	„	0	0½
Biscuit, new ...	„	0	3	Sugar	„	0	4
Celery Seed ...	„	0	5	Vinegar	per pint	0	1

So far so good. It is when one comes to other principal articles of dietary, such as margarine, butter, cheese, bacon, ham, fish, fruit, eggs, etc., that the complications commence. The responsibility for the perishable articles, except fresh meat, has not been accepted by the Admiralty, and their supply has been left in the hands of outside contractors. The prices of the goods in the canteen, administered by the Navy and Army Canteen Board, are very much in agreement with the prices on shore, and thus has arisen from time to time the request from the men for increased rates of messing allowance. For instance, on four certain staple articles of food the canteen prices are as follows; market prices (January, 1919) are added:—

		Canteen Price. s.	Canteen Price. d.	Market Price. s.	Market Price. d.
Butter	per lb.	2	6	2	6
Margarine	„	1	0	1	0
Bacon (back rashers)	„	2	4	2	6
Cheese	„	1	7	1	8

Canteen ship's fund.

It must be remembered that the Navy and Army Canteen Board is paying in a 5 per cent. rebate to the canteen ship's fund on each ship, which is administered by the ship's company committees. In a ship with a complement of 950 men and eighty officers the rebate would amount to about £900 per year. This money is distributed among the men at so much per head when it has not been voted away for recreation or charitable purposes. A good Christmas dinner will be provided for those on board ship, the boys' travelling expenses will be partly met, hospital, hostel and orphan funds are subscribed to, and in the case of the death of a shipmate it is usual to send a sum like £10, at once, to the widow, mother or sister of the deceased. The sports fund would probably receive £250 a year, thus enabling football, cricket, and other games to be played without any individual expense to the players.

Increases in the rate of messing allowance.

The first increase in the rate of messing allowance took place in the early days of the war when the price of bacon went up and the men were complaining. A curious instruction was issued to the Grand Fleet; the paymasters were directed to ascertain from the

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canteen bills of the men's messes for some months back what bacon had been purchased from the canteens, so that the difference in the cost on the old price could be refunded to the men. It meant much onerous work and would not have met the case adequately, as the cash purchases of the men, which are probably more than the credit ones, of this article, could not have been taken into account. The accountant staffs, in addition to their own duties, were working night and day as decoders, and were stationed for all sorts of war duties in the ship, and the paymasters suggested instead that an increase of ½*d.* per day to the messing allowance should be made. This was at once concurred in, and the principle adopted, that the rate of the messing allowance must depend on the canteen and market prices prevailing. The prices of the Government articles have remained stationary throughout the war. Prior to the recent concession of 3*d.* a day, the men were accustomed to put about 6*s.* per head out of their own pockets into their mess bills each month. As stated, the market price value of the standard ration is about 1*s.* 8*d.*, but the value of the food consumed by the men is better appreciated when the low prices of the Government stocked articles and the rebate given on purchases in canteen are taken into consideration.

Ship's tobacco.

It is of interest to note that tobacco is issued in leaf, at 1*s.* a lb. and in a manufactured state at 1*s.* 2*d.* It is a valuable concession to officers and men, of time honoured standing. Each person is allowed to take up each month 1 lb. when serving in Home waters and 2 lb. when abroad. It is some years since the manufactured article was introduced into the Navy to compete with the leaf tobacco, but it has gradually grown into favour and is now the more popular. In one of the Naval Barracks, the proportion of the issues was nearly 3 to 1 in its favour. The tobacco is worth ashore about 13*s.* 6*d.* a lb. Soap is issued at 2½*d.* a lb.

Entering of men.

Since the Crimean War men have been entered in the Navy on a system of continuous service. The men sign an engagement for twelve years' service and then re-engage to complete time for pension, which is now gained by twenty-two years' service. Sir James Graham introduced the change in the entry of men of taking on men for long service. The Admiralty thereby became more than ever the guardians of the men's interests when they obtained the men young and were in a great measure independent of the market conditions of supply and demand. The long-service man is the backbone of the Service, and individually is considered by his officers to compare more than favourably with the man entered under the short service system, which was introduced some twenty years ago to provide for a reserve in war time, and which, under this head, has justified its introduction.

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Voluntary engagements.

The engagement of the seamen class of the Navy for long service is of a voluntary nature, but the description voluntary requires explaining. A great many of the boys are sent in by their parents, who reckon it a good opening, but who also have an eye on the allotment of pay which will be made out in their favour. In our training establishments the boys are induced to allot to their parents, and consequently there are only a few of them who do not do so. This allotment is probably a very good recruiter, acting in some degree as the bounty did in the old days, but it is a bounty to the parents. Naturally most of the boys are eager for a sea life and would be glad to be in the training establishment, parent or no parent, to advise them.

Discharge by purchase.

The individual, once in the Navy, is retained as long as the Navy wishes to retain him, until he reaches the age of thirty. His parents get him signed on to serve for twelve years from the age of eighteen, and he often joins up as early as the age of fifteen. He can only be released during the twelve years by discharge by purchase, unless he chooses to desert. The purchase-money is of varying scale (£24 from the age of 18 to 22, £18, 22 to 26, etc.), and the difficulty of raising the sum required prevents many a young man from leaving the Service although he would like to. There are lower rates if a man joins the Fleet Reserve, after a certain number of years' service, and this proviso acts as a safety valve, while at the same time it constitutes a reserve for war expansion purposes.

Extending the voluntary principle.

It has been suggested that a desirable amendment in the regulations would be to allow the individual on attaining his majority, when he ceases to be an infant in the eyes of the law, to elect to renew his contract, or to take his discharge to the shore. This arrangement would also help to ensure automatically that good conditions existed in the Navy and that the naval man was not behind his civilian brother in opportunity. However satisfactory the conditions may be in the Navy, a certain number of men would leave it on attaining the age of twenty-one, if they could, to venture on the freer life on shore, but on the other hand any vacancies so caused could be filled readily enough from that large class of those men who would like the naval life, but who miss the opportunity of entering as boys, and, who, under existing conditions, can only enter as stokers, Marines, or as miscellaneous ratings.

1797 and 1918—a comparison.

The discontent in the Fleet, in 1797, at Spithead, was due to causes almost similar to those which have been at the bottom of the dissatisfaction in the Navy of 1918. Then, as now, the wages had not been altered for a long period, but the purchasing power of the money had considerably declined. The wives of the seamen then had to

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appeal for parochial relief; to-day they feel the strain of living more than the wives of the working men on shore do. Then, the soldiers received an increase of pay which had not been granted to the seamen. To-day, the munition workers have been handsomely remunerated, while the seamen's pay has been only slightly increased. Then, the victualling was bad; now, the victualling has been satisfactory. Here is an important difference. Then, the spirit of republicanism was going once more in the history of the world to create a new heaven on earth; to-day, the eager desire for better conditions for the ordinary man is stirring the world to unrest. Petitions by seamen then, took the place of the "loyal appeals" of to-day, but petitions were not in order unless signed,* while, to-day, they can only be presented through unofficial channels.

Article 11 and welfare conditions.

Article 11 of the King's Regulations and Admiralty Instructions strictly forbids any combination of persons for the purpose of altering conditions in the Service. It has, however, been put forward, that with officers and men acting as a Welfare Committee, no infraction of this regulation is contemplated. We already have a committee somewhat of this nature in each ship, under Article 856, King's Regulations and Admiralty Instructions, which is:—"The affairs of the canteen are to be administered by a finance and scrutiny committee, composed of—The Executive Officer of the ship, as ex-officio president, a senior Lieutenant, as vice-president, the Accountant Officer, who is to combine the duties of honorary secretary and honorary treasurer, the Medical Officer or another commissioned officer, together with such representatives of the ship's company as may be detailed or arranged for quarterly by the Captain for this duty." The representatives are elected by the different classes on the lower deck. Any one on board ship will testify to the extreme usefulness of this committee. Occasionally questions are brought forward which are not exactly on the agenda and have more to do with other than canteen matters, but the officers are able to keep the discussion within proper lines and limits. The Navy is a very democratic place away from the quarter deck. One gathers that the Welfare Committee proposed is in the nature of a development of the Canteen Committee, which was inaugurated in 1907, on the recommendation of the Login Victualling Committee.

Origin of Article 11.

It is interesting to note how Article 11 of the King's Regulations and Admiralty Instructions came to be inserted in the Regulations. It was originally issued as a circular to the Fleet under the following circumstances.† "In 1860, another petition of a very important

* Rejected by Lord Howe on this account.

† "Leaves from my Log Book," Admiral Sir J. C. Dalrymple Hay, p. 354.

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character, signed by the Lieutenants of the Channel Fleet, sixty-four in number, approved by most of the captains of the ships in which they were serving, was presented to the Admiralty through the Commander-in-Chief of the Fleet, in which the grievances of the petitioners were most respectfully made known to the Board. No reply was given to that memorial but the following circular was issued."

Article 11, K.R. & A.I.

The circular was then embodied in the King's Regulations and Admiralty Instructions as Article 11, as follows:—"Combinations. All combinations of persons belonging to the Fleet formed for the purpose of bringing about alterations in the existing regulations or customs of His Majesty's Naval Service, whether affecting their interests individually or collectively, are prohibited as being contrary to the traditions and practice of the Service, and injurious to its welfare and discipline. Every person is fully authorised individually to make known to his superior any proper cause of complaint, but individuals are not to combine, either by the appointment of committees or in any other manner to obtain signatures to memorials, petitions or applications, nor are they collectively to sign any such documents."

A Civil Service administration.

Welfare matters of naval officers and men are very much in the hands of the civil servants of the State who are serving at the Admiralty and at the Treasury. At the Admiralty the civil servants serve under the Naval Lords, but the departments which are allocated to the control of each Naval Lord, acting with but little naval assistance, are of so extensive a nature that the naval influence is spasmodic and not continuous.

Suggested infusion of a naval element.

Civil servants working on naval service will not be so devoted to the interests of the Navy as naval officers and men are. The civil servants, comparatively speaking, are only indirectly concerned with the efficiency of naval work. The naval reformer of to-day is on safe ground in calling in the name of efficiency for an infusion of the naval element into all of the administrative departments of the Admiralty, for, with the best intentions in the world the civil servants who are employed on naval matters must suffer from a want of knowledge which must always handicap their finest efforts. Such a reform would go some way to meeting the requests of the men for a more sympathetic understanding of the welfare matters of the lower deck, but more than this is asked for. In these days of democracy, when government is by consent of the governed, and the Navy is manned by a voluntary enlistment, it is argued that any system as a system should be open to the freest criticism, and that publicity should be welcomed, for so only is the State likely to obtain the

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whole-hearted co-operation of the greatest number who, in the Navy, are and must be the ruled, and prepared to obey as a strictly organised service requires. The question, in consequence, has been to try and establish a line of demarcation between the welfare conditions and the disciplinary rule of the Navy, and if this is feasible, then to set up some official machinery whereby these welfare conditions may be always under revision. Although agitation is the soul of politics, and more often than not leads to the changes agitated for being brought about, every well wisher in the Navy, man as well as officer, realises that it should never come afloat.

Loyal appeals.

Within the last thirty years endeavours to improve their material conditions have been made *sub rosa* by certain naval ranks through the medium of politicians, the press, death benefit societies, etc. Combinations which are strictly forbidden under Article 11 of the King's Regulations and Admiralty Instructions have yet taken place within the last ten years. The Navy has come ashore in these days of machine-driven vessels, working from bases, and both naval officers and men are merged more than ever before in the common stock of civil life. "Loyal appeals" have been addressed to their Lordships for many years now by the lower deck without any direct rebuff or enquiry by the authorities, and these appeals have been supported by politicians who have had an interest in the votes of the seamen. Not only this, and to give the politicians their due, the parliamentary representatives of the Home ports—Portsmouth, Devonport and Chatham—have considered it to be their duty to consult the officers and men of their respective constituencies relative to the conditions existing in the Navy; and afterwards they have approached the Parliamentary Secretary of the Admiralty upon the points raised.

Representation conceded to the men.

The Navy has requested that these things should be done in the open, and the Admiralty has now granted this request. Representation of the lower deck has been conceded. A committee of officers, with representatives of the men acting in an advisory capacity, will be authorised to discuss and report on matters relative to pay and allowances, promotion, accommodation, messing and canteen arrangements, uniform and clothing arrangements, pension and retirement, and similar matters which affect the general interests of the Service. The line of demarcation has been drawn between disciplinary and welfare matters. By introducing this reform the Admiralty has, in all probability, excluded trade unionism from the Service, as the policy of a trades union was regarded by so many as the only alternative to a system of representation. The movement to obtain improved conditions had grown up outside the

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actual Service. It was claimed that the disciplinary organisation had not been adversely affected, but no one really knew the scope or temper of the backstairs movement as its work was carried out in secret, in confidence, on shore and not on board ship, and on shore in a large measure underground. The good work aimed at suffered from the malady of suppression. The time had certainly arrived to take occasion by the hand and to supplant this system of secret endeavour by a system of representation open and above board, a counsel table at which all who have ideas of improvement can meet and discuss matters of welfare for the common good of the Navy. The Admiralty have provided the machinery, and it is now for the officers and men to work it. A great advance towards contentedness in the Fleet has thus been made. The committee under Admiral Sir T. Jerram must be given credit for the success it has achieved, a success which was anticipated by all those who had knowledge of how harmonious had been its working. For the first time representatives of the lower deck have been called upon to serve in an advisory capacity on an Admiralty committee, and the result augurs well for a contented Navy in the future.

Principle for fixing Naval pay and wages.

What is the principle which should be adopted for fixing the rates of pay of officers and men of the Fleet? Is it not that taking into consideration the hardships of the sea life, one and all, class for class, profession for profession, trade for trade, man for man, should receive something more than would be obtained in the ordinary course in civil life? In these days when the ordinary man in civil life will probably not have to scrape and scratch for a living, something must be done to keep the naval life attractive to the youth and manhood of the nation. We have the example before us of how difficult it has always been to raise an efficient *personnel* for long service in the United States Navy. Also, in our own colonies, the sea work has been carried out chiefly by officers and men from the old country owing to the native element electing not to go to sea. We must remember the desertions in our Navy in pre-war days, especially when our ships visited the United States. Those who deserted were chiefly seeking higher wages. It was a recurring loss of trained men which reflected no credit on the policy of paying so small a wage. Bearing these things in mind, and realising that we shall always require the finest of our manhood to engage in our Navy, if it is to retain its pre-eminent place among the navies of the world, it is to be hoped, that the Government will always be on the side of generosity in fixing the ever-changing scales of pay for officers and men, and in this respect, at any rate, add a real attraction to the sea calling.

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The officer and contented men.

Another and a most important point of view to be taken when considering the pay of the men is that of the officer who, to be an efficient officer in these days, must be free of the cares which arise when working with a discontented *personnel*. The art of naval warfare is a complicated one, and grows more so daily, owing to new means of aggression and the counter measures of defence. In order to master it the officer must give his whole mind to it. The sea is a jealous mistress, and exacts a constant attention quite apart from the naval business, which is all extra. The modern naval officer has really not the time to devote to coaxing the men to do their duty when they are backward owing to what may be called welfare grievances. He must have contented men alongside him. Let the conditions of service in the Navy be so adjusted that it will be a punishment for any man to be discharged to the shore on account of his services being no longer required. Willing, keen, eager men are necessary, and the State should ever aim at removing all real cause of grievances, and all steps should be taken to discover if they exist. The officer can then go right ahead; the human nature differences can well be left to the officers to adjust. The naval officer, as a rule, is a specialist in this, taking a pride and pleasure in knowing his men, and being a student of their individual idiosyncrasies. PAYMASTER COMMANDER R.N.

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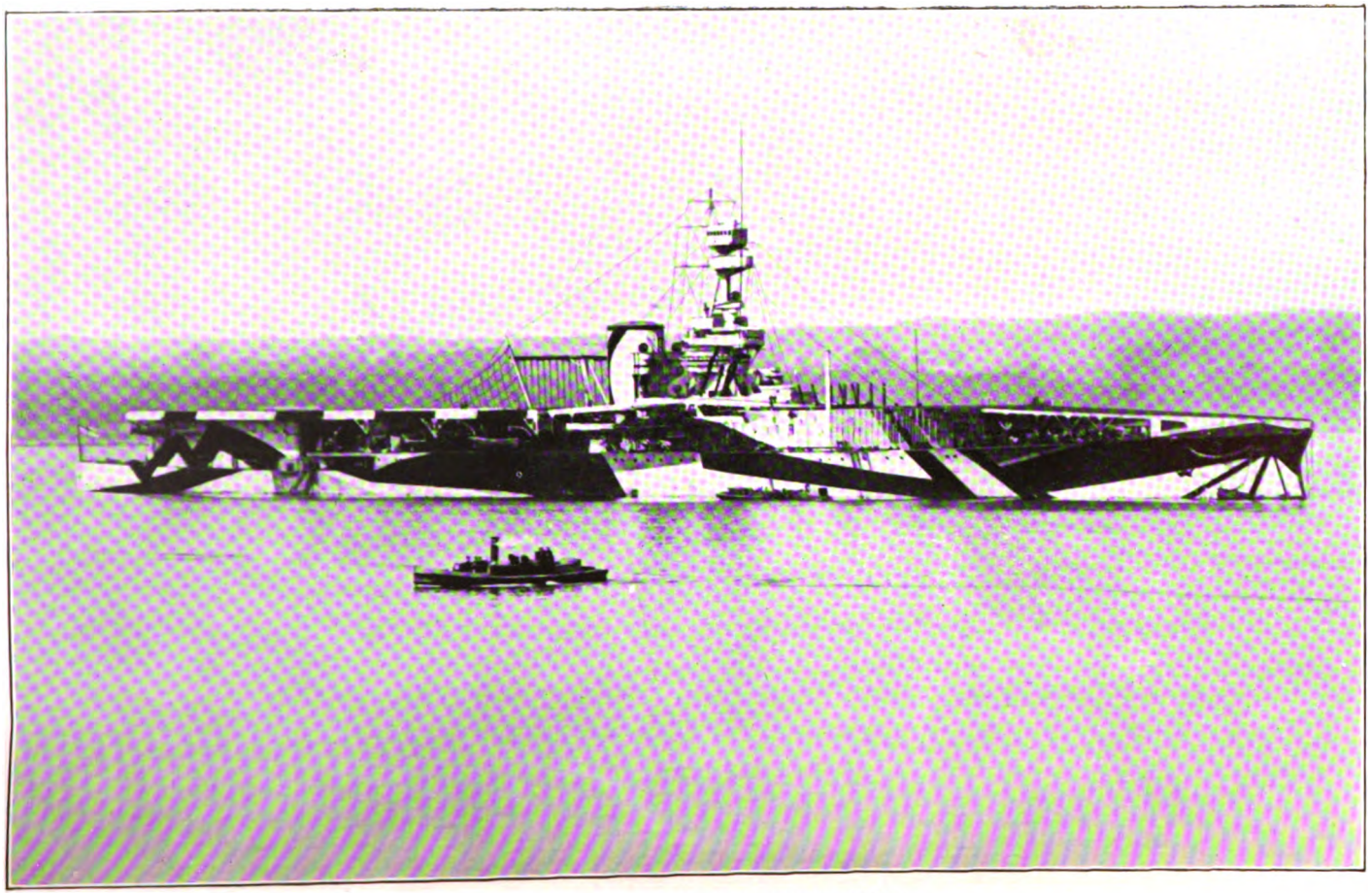

H M. AIRCRAFT-CARRIER "FURIOUS."

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CHAPTER XII.

Naval Aircraft.

The Royal Naval Air Service ceased to exist on March 31, 1918. The Navy has not stood still since that time in the matter of navigating the air. It has, on the contrary, flown fast and far, and has an air organisation of its own. The arrangement by which the heavier-than-air craft departed from the Navy, which was left in control of airships and balloons, was strange and anomalous. This is a question which shall not be discussed here, but the remark shall be made that if ever there was Naval work it was in the "downing of frightful Fritz." Months before the date of the Armistice it was announced that the distance flown by the aircraft of the coast patrol had exceeded by fifteen times the circumference of the globe. These naval knights of the air made their mark long ago. They appeared at Antwerp, flying from carriers, quite early in the war, patrolled the East coast against the German mine-layers, and attacked the North German Frisian coast. They were responsible for all the air work at the Dardanelles, and made invaluable photographic surveys. They were always working with the Grand Fleet. They made the Bulgarians feel unhappy; they dropped bombs on the Turks at Constantinople, Gaza and thereabout; and they were active in the solution of the Mesopotamian problem. They spotted for the guns which destroyed the fugitive German cruiser Königsberg in the jungle-clad reaches of the Rufigi River. From dawn to dusk they flew over Ostend and Zeebrugge, and made photographic surveys which have never been excelled, spotting for the guns there also. They searched and patrolled the spiders' web about the North Hinder Light with such persistent vigilance that Fritz, coming out from Zeebrugge, or oiling south from the German Bight, had really the time of his life, and not seldom of his death. Who will say that it was not naval work to descry in a failing light a few feet of periscope not much thicker than a broomstick, to master the habits of Fritz, to know when he must keep on the surface and when he must submerge, to discover him by directional wireless bearings, and pounce down upon him if possible before his hydrovanes could carry him under, or to drop eggs in a series like a barrage across his course?

Aircraft carriers.

Quite a number of ships were taken over by the Navy as plane carriers. The Campania joined the Grand Fleet, and the Menelaus was a kite-balloon ship. Now the Navy has three big plane carriers of

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its own in service—the great, light, dazzle-painted cruiser Furious, with her hollow body full of fighting and scouting planes, and her immense platform with unbroken run, upon which they can alight—the same ship that carried the machines that bombed the German Zeppelin station at Tondern; the fantastic Argus, with her extraordinary high freeboard, and the smoke coming up from under her stern, which amazed the Germans at Rosyth; and the new Vindictive, which carries 7·5-in. guns and can travel at 30 nautical miles an hour. There is also the still stranger Eagle, now completing at Messrs. Armstrong's yard on the Tyne—the mystery ship, and one of the largest ships in the Navy, of which Mrs. Page, wife of the American Ambassador, stood sponsor, when she was launched in June last year. Lord Jellicoe repeatedly insisted that he must be provided with airships to act as scouts of the Grand Fleet. Aeroplanes were required also which could fly off easily from the deck or from the special platform of a warship, and could climb rapidly. The little Engadine, in the Jutland Battle, did the best she could with her aeroplane. New great naval airships were built and are building. Indeed, the Service already possesses quite a considerable air fleet, consisting of dirigibles of various classes and sizes, and of kite balloons fixed inshore or towed out by destroyers and other vessels. Ships of these classes assisted very greatly in the work of the coast patrols, and contributed most efficiently to the safety of shipping. By the end of 1910 nearly every flagship leading a division had a kite-balloon, and they were flown from light cruisers, destroyers, and even trawlers.

Seaplanes.

But planes of various classes are probably more useful. The real difference between a land machine and a seaplane is that the first rises from and alights on the land, while the second usually rises from and alights upon the water. It is true that aeroplanes of the land type may be flown from ships like the Furious, and may alight upon her over-head stage, but if they have to alight on the sea they will be in difficulties, unless provided with gas-bags for temporary flotation, which, however, are an impediment and not very practical, and even if so provided they cannot live long without help in the sea. But aeroplanes have many times flown in the Naval service, and a "camel" did, in August, 1918, fly upward from a special lighter to 19,000 ft. off Tershelling, and destroy a Zeppelin.

German flying boats.

The Germans went a long way in the building of big seaplanes. They found it urgently necessary to counter, if they could, the enterprise of British flying boats, and C.M.B.'s, which distressed them in the "wet triangle." When old Count Zeppelin realised that his airships were a failure, subjected as they were to a rain of incendiary

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bullets and other modern destructive methods, he designed a giant and solidly-built monoplane flying-boat. His idea was that she should rise at a coast station from the water, fly inland to execute her service, and return to alight on the water. The monoplane type was adopted in order to avoid the trouble which arose from the lower plane dipping in the sea. This giant had a wing-spread of well over 2000 sq. ft., the planes being of about 130 ft. spread, and from 15 ft. to 20 ft. broad. The boat, in which a man could stand nearly upright, was built chiefly of steel and duralium, and between the wings was a pilot 'house, which included a sound-proof room for the wireless operator. An American officer who saw this strange object at the Norderney air station remarked: "If a Sopwith 'camel' couldn't fly off it while that monoplane itself is in full flight, I'll eat it!" There was a still bigger flying boat at the experimental station of Warnemünde, which carried four engines, and had a wing space of about 150 ft., and when sixteen men were in the fusilage, the officer who described it said, standing on the floor, he could catch no glimpse of any one of them. These German boats were much larger than the early type of Curtiss flying boats, but there were many of smaller class.

Whatever the Germans possessed in the way of flyers, unquestionably British naval flying men made far better use of the planes they employed.

Seaplane types.

There are two types of seaplanes. Each of them has the advantage that in case of slight engine trouble the pilot can alight on the water, set matters right, and fly again. One type is that of the seaplane proper, which carries two floats instead of wheels. These machines can be run out on an under-carriage, or be hoisted out from a quay or mole by a crane, and can move along the surface at moderate speed. In a tumbling sea it is not easy to rise, and there are difficulties in handling the craft in the water. Indeed the float seaplane is rather a fair-weather craft, which is not to say that machines of this class have not rendered invaluable service in the war.

The flying boat has a boat body, usually constructed mostly of wood, giving accommodation to the crew, supplies, petrol and wireless apparatus. The wings are attached, and the engines are between the planes. Some of these craft can carry as large a useful load as a land plane, and travel even faster. The boat has usually a stepped underbody, and as the engine carries the machine along the surface she rises on one step after the other, until at last she just touches the water, travelling at such speed that the planes soon give sufficient lifting power. So seaworthy are these flying boats that they have been known to ride out a 60-mile gale. Some of the modern

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boats are quite roomy 6-tonners, many of them fitted with two Rolls-Royce engines, giving 600 H.P. together.

Flying boats.

Felixstowe was the chief station for dealing with Fritz. Yarmouth was a good second. Over against Harwich, Felixstowe worked in conjunction with the famous flotilla which Admiral Tyrwhitt commanded, and which made it necessary for the U-boat officer to be very wary. At Harwich the Admiralty had an experimental station, where a great deal was done to devise means for outwitting and defeating the submarine. Great credit must be given to Commander John Porte, who had designed the first America flying boat for the Curtiss Company of New York. At Felixstowe he designed the biggest flying boat which up to 1915 had been built in England, and successively he developed the F class, with a V-shaped bottom, which enabled the boats to get off and alight in the water more easily. The latest of the class had two engines giving together 700 H.P., the machine complete weighing 13,000 lb. when fully loaded, and having a maximum speed of 103 miles an hour. There was also a machine known as the Felixstowe Fury, being a triplane, which had a lifting surface of over 3000 sq. ft., and five engines with an aggregate of 1800 H.P. This giant was flown with a total weight of 32,000 lb., a crew of twenty-four, fuel for seven hours, and 4500 lb. of sand. More will be heard of her class.*

Aircraft lighters.

Flying boats used during the war, in hard service in the North Sea, including long scouting over the German Bight, flying up from semi-submersible lighters, which destroyers towed at high speed, were necessarily of a sturdy class, with large engine-power, for they mounted four or five machine guns, and they carried four bombs of 100 lb. or two of 230 lb., with a crew of two pilots, a wireless operator and an engineer. Scouting machines are of lighter type. That there is a great future for naval aviation no one can doubt, and a wide field for designers and constructors of machines and makers of engines. There cannot be one type of machine for all purposes. Each machine must be designed and engined for its special purpose, and the requirements of load and equipment must be taken into account in each case. Scouting planes may have engines of 350 H.P., but long-range reconnaissance, demanding larger fuel capacity, carried out by planes provided with high-power wireless, will require greater engine equipment, and the big bombing machines will be the most powerful of all. Before the war the Royal Naval Air Service had Short, H. Farman and Sopwith biplanes; and about twenty of these gave a fine display before the King at the departure of the Fleet

* For a good account of the Felixstowe flying boats and their service see *The Times*, March 31st.

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H.M. ROYAL NAVAL AIRSHIP R 33.

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from Spithead, following the great mobilisation, on July 20, 1914. There were large and small Americas and other types, and the Handley Page, Martinsyde and other machines have come to the fore.

Aircraft as Naval scouts.

The airship and the seaplane and flying-boat will replace to some degree the scouting cruiser. They will be the eyes and ears of the Fleet. The range of reconnaissance and observation will be extended. The cruiser and the flying-boat or seaplane will often work together in fleet movements, exercises and manœuvres. In distant operations there is evidently a great future for the naval flying men. The Arc Royal at the Dardanelles brought them into operation at a distance from their base. Experience and ingenuity have brought about considerable advances in the flying service. The semi-submersible lighter, which could fill her tanks and allow the flying-boat to enter a sort of cradle, and then blow out her tanks, getting into trim to be towed to the scene of operations, was a remarkable feature of air work in the war. In peace time the Navy must not neglect any element necessary for its duties on active service. There must be a naval aircraft service in peace, with its proper supply of flying-boats or seaplanes, and all that is required for the maintenance and proper employment of such an aircraft service.

The war has shown that the flying-boat and seaplane are essential elements of the Navy. They must develop *pari passu* with the big airship, though in practice their work may not always be the same. The airship can rarely be other than an air cruiser for scouting work, of the utmost value in suitable weather. The flying machine can fly in a wind, when necessary, which would prove disastrous for an airship. It can travel at higher speed, and can carry reconnaissance beyond the range of the airship, though the latter has greater endurance and may remain longer away from her base. Many difficulties which attended air navigation have been overcome. The controlling conditions are studied and known. Suitable flying days are recognised. For scouting about the British Isles and in the North Sea they number about half the days in the year for craft heavier than the air. The difficulty of providing engines, which was a real one early in the war, has now almost disappeared. We are evidently at the threshold of a new era and of a larger development in flying, and the Navy must lose no advantage which air navigation lays open to it.

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PART II.

LIST OF BRITISH AND FOREIGN SHIPS.

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PART II.

LIST OF BRITISH AND FOREIGN SHIPS.

The following abbreviations are used throughout the Alphabetical List:—

a.c. Armoured cruiser.	g.v. Gun-vessel.
a.g.b. Armoured gunboat.	H.S. Harveyised or simi'ar hard-faced steel.
b. Battleship.	K.S. Krupp steel.
b.cr. Battle-cruiser.	A.I. Armstrong improved steel.
l.cr. Light cruiser.	shd. Sheathed.
Flot. ldr. Flotilla leader.	P. Protected.
c.d.s. Coast-defence ship.	*t.* Turret-ship (in class column).
comp. (in armour column). Compound or steel-faced armour.	*t.* Speed and H.P. at trials (in speed and H.P. columns).
cr. Cruiser.	s.c. Sea-plane carrier.
A.A. Anti-aircraft guns.	to.cr. Torpedo-cruiser.
d.v. Despatch vessel.	to.g.b. Torpedo-gunboat.
g.b. Gunboat.	

l. Light guns under 15 cwt., including boats' guns.
M. Machine guns.
sub. Submerged torpedo tube.
A. Armstrong guns. K. Krupp guns.

The following abbreviations are used to distinguish the various types of boilers:—

W.T. Water-tube boilers, where the type is not known.	My. Myabara.
B. Belleville.	Nic. Niclausse.
Bl. Blechynden.	Nor. Normand.
B. & W. Babcock and Wilcox.	N.S. Normand-Sigaudy.
D'A. D'Allest.	R. Reed.
D. Dürr.	T. Thornycroft.
E. Earle.	T.S. Thornycroft-Schulz.
Ex. Express.	W.F. White-Forster.
Du T. Du Temple.	Y^1. Yarrow small tube.
L. Laird.	Y^2. Yarrow large tube.
L.N. Laird-Normand.	V.E. Vickers Express.
M. Mumford.	cyl. Cylindrical.

The following abbreviations distinguish types of turbines:—

P.T. Parsons.	C.T. Curtis.
S. Schneider.	B.C.T. Brown-Curtis.

A reference is now given in the ship tables to the plates in which diagrams of the ships appear.

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GREAT BRITAIN.—Armoured Ships.

Class	NAME.	Displacement.	Length.	Beam.	Draught	Horse-Power.	Where Built.	Makers of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour: Belt.	Armour: Deck.	Armour: Side above Belt.	Armour: Bulkhead.	Armour: Gun Position. Heavy Guns.	Armour: Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal.	Fuel. Oil.	Complement.
		tons	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.		
c.	Achilles . *Pl. 17.*	13,550	480	73½	27	23,275 Y² & cyl.	Elswick .	Hawthorn	1905	1907	1,191,103*	6–4–3 K.S.	¾–1	6	6	6	6	6 *9·2-in.*, 4 *7·5-in.*, 24 *3-pr.*, 2 M.	3	23·27 *t*	1000		704
b.	Africa† *Pl. 10.*	16,350	425	78	26¾	18,698 (B. & W. & cyl.)	Chatham	J. Brown .	1905	1906	1,461,429*	9 H.S.	2–1	8–7	12 H.S.	12–6 H.S.	7 K.S.	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, & M.	4	18·95 *t*	950	2150	825
b.	Agamemnon . *Pl. 10.*	16,500	410	79½	27	17,285 Y²	Dalmuir .	Hawthorn Leslie	1906	1908	1,651,289*	12–6 K.C.	2	8	8	12	7	4 *12-in.*, 10 *9·2-in.*, 24 *3-in.*, 4 *3-pr.* & 4 A.A.	3	22·42 *t*	900	2500	865
b.	Agincourt (*ex* Osman I) *Pl. 5.*	27,500	632	89	27	34,000 B. & W.	Elswick .	Vickers P.T.	1913	1914	..	9–4 K.S.	2–1	6	6 K.S.	9 K.S.	6 K.S.	14 *12-in*, 20 *6-in.*, 10 *12-pr.*	3 sub.	22	3200	620	1100
.	Ajax . . *Pl. 7.*	23,000	555	89	27½	28,000 B. & W.	Greenock	Scott P.T.	1912	1913	1,937,631*	12–6	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*	3	22 *t*	900		900
c.	Antrim . *Pl. 18.*	10,850	450	68½	25	21,604 Y. & cyl.	Clydeb'nk	J. Brown	1903	1905	906,335*	6–2 H.N.	2–¾	..	4½ H.N.	6 H.N.	6 H.N.	4 *7·5-in.*, 6 *6-in.*, 20 *3-pr.*, 2 M.	2	23·02 *t*	800	1950	655
b.	Barham . *Pl. 2.*	27,500	600	90½	28¾	75,000 B. & W.	Clydeb'nk	J. Brown B.C.T.	1914	1915	..	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 5 M., 2 A.A.	4	25	Oil	2800	925
b.	Bellerophon . *Pl. 9.*	18,600	490	82	27	23,000 B. & W.	Portsm'th	Fairfield P.T.	1907	1909	1,765,342*	11–6–4 K.C.	..	8	..	11 K.C.	..	10 *12-in*, 16 *4-in.*, 4 *3-pr* & M.	3	21·80 *t*	900		780
b.	Benbow . *Pl. 3.*	25,000	580	90	28	29,000 B. & W.	Dalmuir .	Beardmore P.T.	1913	..	2,027,115*	12–8	1–2½	9–8	1–1½	10	6	10 *13·5-in*, 12 *6-in.*, 4 *3-pr.* 2 A.A.	4	21	3250	1050 Oil	828
c.	Berwick *Pl. 19.*	9800	440	66	24½	22,681 Nic.	W. Beardmore & Co.	Humphrys	1902	1903	750,984	4–2 H.S.	2¾	..	5 N.S.	5–4 N.S.	4 N.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·61 *t*	800	1600	537
	Canada (*ex* Almirante Latorre) *Pl. 4.*	28,000	625	92	28½	37,000 Y²	Elswick .	J. Brown P. & B.C.T.	1913	1915	..	9–4 A.I.	4–2½	4½	..	10	6	10 *14-in.*, 14 *6-in.*, 6 *3-in.*, & M.	4 (sub.)	23	3300	520	1000

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a.c.	**Carnarvon** *Pl. 18.*	10,850	450	68½	25	21,489 Nic.&cyl	Beardm're	Humphrys	1903	1905	890.840*	6–2 K.S.	2–¾	..	4½ K.S.	6 N.S.	6	4 *7·5-in.*, 6 *6-in.*, 20 *3-pr.*, 2 M.	2	23·3 *t*	800	655
b.	**Centurion** *Pl. 7.*	23,000	555	89	27½	28,200 Y²	Devonp'rt	Hawthorn P.T.	1911	1913	1,939,648*	12–6	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*	3	22 *t*	900	909
a.c.	**Cochrane** *Pl. 17.*	13,550	480	73½	27	23,654 Y² & cyl.	Govan	Fairfield	1905	1907	1,193,121*	6–4–3 K.S.	¾–1	6	6	6	6	6 *9·2-in.*, 4 *7·5-in.*, 24 *3-pr.*, 2 M.	3	23·29 *t*	1000	704
b.	**Collingwood** *Pl. 9.*	19,250	500	84	27	24,500 Y²	Devonp't	Hawthorn P.T.	1908	1910	1,731,640*	10–6–4	¾–1¾	8	..	9	..	10 *12-in.*, 18 *4-in.*, 4 *3-pr.*, 5 M.	3	21·5 *t*	900	724
b.	**Colossus** *Pl. 8.*	20,000	510	85	27	25,000 B. & W.	Greenock	Scott P.T.	1910	1911	1,672,663*	11–3	2½	8	..	11	..	10 *12-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	21·5 *t*	900	780
b.	**Commonwealth** *Pl. 10.*	16,350	425	78	26¾	18,538 B&W&cyl	Govan	Fairfield	1903	1905	1,481,811*	9 H.S.	2–1	8–7	1½ H.S.	12–6 K.S.	7 K.S.	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, M.	4	19·01 *t*	950 2150	825
b.	**Conqueror** *Pl. 7.*	22,500	545	88½	27½	29,835 B. & W.	Dalmuir	Beardmore P.T.	1911	1912	1,885,295*	12	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	22·12	900 2700	800
a.c.	**Cornwall** *Pl. 19.*	9800	440	66	24½	22,699 B. & W.	Pembroke	Hawthorn	1902	1904	756,274	4–2 H.S.	2–¾	..	5 N.S.	5–4 N.S.	4 N.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·68 *t*	800 1600	537
a.c.	**Cumberland** *Pl. 19.*	9800	440	66	24½	22,000 B.	Glasgow	London & Glasgow Co.	1902	1904	718,168	4–2 K.S.	2–¾	..	5	5–4	4 N.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·68 *t*	800 1000	537
a.c.	**Devonshire** *Pl. 18.*	10,850	450	68½	25	21,475 Nic. & cyl.	Chatham	Thames Ironworks	1904	1905	850,877*	6–2	2–¾	..	4½ K.S.	6 N.S.	6	4 *7·5-in.*, 6 *6-in.*, 20 *3-pr.*, 2 M.	2	22·97 *t*	800 1600	655
b.	**Dominion**† *Pl. 10.*	16,350	425	78	26¾	18,438 B. & W. & cyl.	Barrow	Vickers	1903	1905	1,455,190*	9 K.S.	2–1	8–7 K.S.	12 K.S.	12–6 K.S.	7	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, M.	4	19·5 *t*	950 2150	825
a.c.	**Donegal** *Pl. 19.*	9800	440	66	24½	22,173 B.	Govan	Fairfield Co.	1902	1903	715,947	4–2 K.S.	2–¾	..	5 K.S.	5–4	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·56 *t*	800 1600	537
b.	**Dreadnought** *Pl. 9.*	17,900	490	82	26½	27,500 B. & W.	Portsm'th	Vickers P. T.	1906	1906	1,813,100*	11–6–4 K.C.	2¾–1¾	8	..	11	..	10 *12*-in., 24 *12-pr.* Q.F., 5 M.	5	21·85 *t*	900 2700	770
a.c.	**Duke of Edinburgh**† *Pl. 18.*	13,550	480	73½	27	23,685 B. & W. & cyl.	Pembroke	Hawthorn Leslie	1904	1906	1,201,687*	6–4–3 K.S.	¾–1	6	6	6	6	6 *9·2-in.*, 10 *6-in.*, 20 *3-pr.*, 2 M.	3	22·84 *t*	1000	704

* Total estimated cost of ship including guns. † See note at the end of this list.

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GREAT BRITAIN.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal. Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in	in.	in.			knots.	tons.	
b.	Emperor of India . *Pl. 3.*	25,000	580	90	28	29,000 Y.	Barrow .	Vickers P. T.	1913	1914	2,020,017*	12-8	1-2½	9-8	1-1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 2 A.A.	4	21	3250 1050 Oil.	828
b.	Erin (*ex* Reshadieh) *Pl. 6.*	22,940	525	91½	28½	26,500	Barrow .	Vickers P.T.	1913	1914	..	12–4 K.c.	3	9–8	12	8	10	10 *13·5-in.*, 16 *6-in.*, 6 *6-pr.*, 2 *3-in.*, 2 M., 4 AA.	4 (sub.)	21·5	2000 700 Oil.	900
c.	Essex . *Pl. 19.*	9,800	440	66	24½	22.000 B.	Pembroke	J. Brown .	1901	1903	739,946	4–2 K.S.	2–¾	..	5	5	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	22·79 *t*	800 1600	537
b.	Hercules . *Pl. 8.*	20,000	510	85	27	25,700 Y²	Jarrow .	Palmer P.T.	1910	1911	1,660,950*	11-3	2½	8	..	11	..	10 *12-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	21·5 *t*	900	780
b.	Hibernia . *Pl. 10.*	16,350	425	78	26¾	18,000 B.&W. & cyl.	Devonp'rt	Harland & Wolff	1905	1906	1,444,828*	9 H.S.	2–1	8–7	12 H.S.	12–6 H.S.	7 K.S.	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, & M.	4	19·0	950	825
b.	Hindustan (*b*) *Pl. 10.*					18,521 B.&W. & cyl.	Clydeb'nk	J. Brown .	1903	1905	1,454,526*	9 K.S.	2–1	8–7	12 K.S.	12–6 N.S.	7 N.S.			19·01 *t*	2150	
b.c.	Hood (*a*) .	..	..	..	..	..	Clydeb'k	J. Brown .	..	..	..	..	..	..	..	..	..	..	..	..	..	..
b.c.	Inflexible	17,250	530	78½	26	41,000 Y²	Clydeb'k	J. Brown .	1907	1908	1,728,229*	7–4 K.C.	..	3	..	7	..	8 *12-in.*, 16 *4-in.*, 5 M.	5	26	1000	780
b.c.	Indomitable *Pl. 16.*					41,000 B. & V.	Govan .	Fairfield P.T.	1907	1908	1,761,080*											
b.	Iron Duke *Pl. 3.*	25,000	580	90	28	29,000 B. & W.	Portsm'th	Cammell Laird P.T.	1912	1914	2,080,918	12–8	1–2½	9–8	1–1½'	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.* 2 A.A.	4	21 *t*	3250 1050 Oil	828
b.c.	Kent . *Pl. 19.*	9800	440	66	24½	21,000 B.	Portsm'th	Hawthorn	1901	1903	700,283	4–2 K.S.	2–¾	..	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	21·7 *t*	800 1600	537

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b.	**King George V.** *Pl. 7.*	23,000	555	89	27½	28,005 B. & W.	Portsm'th	Parsons P.T.	1911	1912	1,965,413*	12-6	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*	3	22 *t*	900	900
a.c.	**Lancaster** *Pl. 19.*	9800	440	66	24½	22,000 B.	Elswick	Hawthorn	1902	1904	732,858	4-2 K.S.	2-⅝		5 K.S.	5-4 N.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	24·01 *t*	800 1600	537
b.c.	**Lion** *Pl. 15.*	26,350	660	88½	28	75,685 Y²	Devonport	Vickers P.T.	1910	1912	2,086,458*	9	..	6	..	9	..	8 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	2	28·5 *t*	3000	980
b.	**Lord Nelson** *Pl. 10.*	16,500	410	79½	27	16,750 B. & W	Jarrow	Palmer	1906	1908	1,654,098*	12-6 K.C.		8	8	12	..	4 *12-in.*, 10 *9·2-in.*, 24 *12-pr.*, 2 *3-pr.*, 5 M.	5	18·9 *t*	900 2200	747
b.	**Malaya**¶ *Pl. 2.*	27,500	600	90½	28¾	75,000 B. & W.	Walker	Wallsend P. T.	1915	1916	..	13-6	3-1	6	4 2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 5 M., 2 A.A.	4	25	Oil 3400	925
b.	**Marlborough** *Pl. 3.*	25,000	580	90	28	29,000 Y²	Devonport	Hawthorn P.T.	1912	1914	2,043,437	12-8	1-2½	9-8	1-1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 2 A.A.	4	21 *t*	3250 1050 Oil	828
a.c.	**Minotaur** *Pl. 17.*	14,600	490	74½	26	27,856 Y²	Devonp'rt	Harland & Wolff	1906	1908	1,438,065*	6-4	1-½	6	..	8	7	4 *9·2-in.*, 10 *7·5-in.*, 16 *12-pr.*, 5 M.	5	23·01 *t*	1000	850
b.	**Monarch** *Pl. 7.*	22,500	545	88½	27½	28,555 Y²	Elswick	Hawthorn P. T.	1911	1912	1,886,912*	12	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*	3	21·88 *t*	900 2700	800
b.	**Neptune** *Pl. 8.*	19,900	510	85	27	27,721 Y²	Portsm'th	Harland & Wolff† P.T.	1909	1911	1,715,258*	11-3	2½	8	..	11	..	10 *12-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	21·78 *t*	900	780
b.c.	**New Zealand**‡ *Pl. 16.*	18,800	555	80	26½	46,894 B. & W.	Govan	Fairfield P.T.	1911	1912	(‡)	..	..	..	..	..	..	8 *12-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	2	25	1000	780
b.	**Orion** *Pl. 7.*	22,500	545	88½	27½	29,108 B. & W.	Portsm'th	Wallsend P. T.	1910	1911	1,918,773*	12	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	21·02 *t*	900 2700	800
b.c.	**Princess Royal** *Pl. 15.*	26,350	660	88½	28	76,510 Y²	Barrow	Vickers P.T.	1911	1912	2,092,214*	9	..	6	..	9	..	8 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	2	28·5 *t*	3000	980
b.	**Queen Elizabeth** *Pl. 2.*	27,500	600	90½	28¾	75,000 B. & W.	Portsm'th	Wallsend P.T.	1913	1915	..	13-6	3-1	6	4-2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 5 M., 2 A.A.	4	25	Oil 3400	925
b.	**Ramillies**	25,750	590	88½	28½	40,000 Y.	Dalmuir	Beardmore, P.T.	1916	1917	..	13-6	4-1	6	6-4	11	6	8 *15-in.*, 14 *6-in.*, 4 *3-pr.*, 2 A.A.	4	23	3120 Oil	915
b.	**Resolution** *Pl. 1.*						Jarrow	Palmer P.T.	1915	1916												

* Estimated cost of ship including guns. † By arrangement with John Brown & Co. ‡ Built at the charge of the New Zealand Government.
¶ Built at the charge of the Federated Malay States. (*a*) Particulars not yet available. (*b*) See note at the end of this list.

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GREAT BRITAIN.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Fuel.	Complement.
												Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.		Coal. Oil.	
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	Revenge	25,750	580	88½	28½	40,000 Y.	Barrow	Vickers P.T.	1915	1916	..	13–6	4–1	6	6–4	11	6	8 *15-in.*, 14 *6-in.*, 4 *3-pr.*, 2 A.A.	4	23	3420 Oil.	915
b.	Royal Oak						Devonp'rt	Hawthorn P.T.	1914	1916												
b.	Royal Sovereign *Pl. 1.*						Portsm'th	Parsons P.T.	1915	1916												
b.c.	Renown	26,500	750	90	25½	112,000 B. & W.	Govan	Fairfield B.C.T.	1916	1916	..	6–3 K.C.	2	6–3	4–3	9–7 K.C.	6 K.C.	6 *15-in.*, 17 *4-in.*, 1 & 2 *3-in.* A.A.	2	32	4250 Oil.	950
b.c.	Repulse *Pl. 13.*						Clydeb'nk	J. Brown B.C.T.	1916	1916												
a.c.	Roxburgh *Pl. 18.*	10,850	450	68½	25	22,102 D. & cyl.	Glasgow	London & Glasgow Company	1904	1905	862,077*	6–2 K.S.	2–¾	..	4½ K.S.	6 N.S.	6	4 *7·5-in.*, 6 *6-in.*, 20 *3-pr.*, 2 M.	2	23·63 *t*	800 1600	655
b.	St. Vincent *Pl. 9.*	19,250	500	84	27	24,500 B. & W.	Portsm'th	Scott's S. P.T.	1908	1910	1,754,615*	10	¾–1¾	8	..	9	6 ..	10 *12-in.*, 18 *4-in.*, 4 *3-pr.*, 5 M.	3	21·9 *t*	900	780
a.c.	Shannon *Pl. 17.*	14,600	490	75½	25	28,553 Y²	Chatham	Humphrys	1906	1908	1,423,410*	6–4	1–½	3	..	8	..	4 *9·2-in.*, 10 *7·5-in.*, 16 *12-pr.*, 5 M.	5	22·49 *t*	950	850
a.c.	Suffolk *Pl. 19*	9800	440	66	24½	22,000 Nic.	Portsm'th	Humphrys	1903	1904	722,681	4–2 K.S.	2–¾	..	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 9 M.	2	24·7 *t*	800 1600	537
b.	Superb *Pl. 9.*	18,600	490	82	27	23,000 B. & W.	Elswick	Wallsend P. T.	1907	1909	1,660,446*	11–6–4 K.C.	..	8	..	11 K.C.	..	10 *12-in.*, 16 *4-in.* B.L., 4 *3-pr.*, 5 M.	3	21·6 *t* 22·07 *t*	900	870
b.	Temeraire *Pl. 9.*					23,000 Y²	Devonp'rt	Hawthorn P. T.	1907	1909	1,743,955*											
b.	Thunderer *Pl. 7.*	22,500	545	88½	27½	27,604 B. & W.	Blackwall	Thames Ironworks P. T.	1911	1912	1,889,920*	12	..	9	..	10	..	10 *13·5-in.*, 16 *4-in.*, 4 *3-pr.*, 5 M.	3	21	900 2700	800

b.c.	**Tiger.** *Pl. 14.*	28,500	660	90½	28½	108,000 B. & W.	Clydeb'nk	J. Brown B. C. T.	1913	1914	2,500,000*	9–3	3–1	6	4–2	9	6	8 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 5 M., 2 A.A.	4	30	3320 900	1110
b.	**Valiant** *Pl. 2.*	27,500	600	90½	28¾	75,000 B. & W.	Govan	Fairfield B. C. T.	1914	1916	..	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in*, 4 *3-pr.*, 5 M., 2 A.A.	4	25	Oil 3400	925
b.	**Warspite** *Pl. 2.*	27,500	600	90½	28¾	75,000 B. & W.	Devonp'rt	Hawthorn P.T.	1913	1915	..	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 5 M., 2 A.A.	4	25	Oil 3400	925
b.	**Zealandia.** (*ex* New Zealand.) *Pl. 10.*	16,350	425	78	26¾	18,440 Nic. & Cyl.	Portsm'th	Humphrys	1904	1905	1,424,375*	9 K.S.	2–1	8–7 K.S.	12 K S.	12–6 K.S.	7	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, M.	4	18·59 *t*	950 2150	825

* Total estimated cost of ship, including guns.

The following classes of battleships and armoured cruisers have been struck out of the lists as non-effective:—Swiftsure, Duncan, Formidable, Canopus and Majestic; Drake and Cressy. The surviving battleships of the King Edward VII. class had been retained for the present, as although struck off the effective list, they might be employed on subsidiary duties.

By an Admiralty Order dated April 9, 1919, the following four ships shown in the above tables were included in a list of "Ships not required for further service":—King Edward class: Africa, Dominion, Hindustan; also the armoured cruiser Duke of Edinburgh.

The new battle-cruiser Hood will be found in the list, but no official particulars are yet available about her. Her three sisters, the Anson, Howe and Rodney, are not to be proceeded with.

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Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Makers of Engines.	Date of Laulch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes	Speed.	Fuel. Coal. Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
Mon.	Abercrombie	6150	320	90	10	2000	Belfast	Harland & Wolff	1914	1915		4	2	..	4	10·8	..	2 14-*in.*, 2 6-*in.*, 2 12-*prs.* and 2 3-*in.* A.A.*		6·5	400	206
,,	Havelock					2300	,,	Harland & Wolff														
,,	Roberts *Pl. 25.*					1800	Wallsend	Swan Hunter														
,,	Lord Clive	5900	320	87·2	10	2300	Belfast	Harland & Wolff	1914	1915		6	2	..	4	10·8	..	2 12-*in.*, 2 6-*in.*, 2 12-*prs.* and 2 3-*in.* A.A.*		6·5	350	180
,,	General Crauford					2300	,,	Harland & Wolff														
,,	Earl of Peterborough					2300	,,	Harland & Wolff														
,,	Sir Thomas Picton					2300	,,	Harland & Wolff														
,,	Prince Eugene					2300	,,	Harland & Wolff														
,,	Prince Rupert					1600	Port Glasgow	Hamilton														
,,	Sir John Moore					2500	Greenock	Scott														
,,	General Wolfe *Pl. 25.*					2500	Jarrow	Palmers														
,,	Marshal Ney	6670	340	90·3	10	1500	,,	Palmers	1915	1915		4	2	..	4	13·8	..	6 6-*in.*, and 2 3-*in.* A.A.		6·5	238 Oil	180
,,	Marshal Soult *Pl. 26.*																	2 15-*in.*, 2 6-*in.*, and 2 3-*in.* A.A.				
,,	M 15 to M 18	570	170	31	6 6	480 to 800	West Hartlepool	W. Gray	1915	1915		..	..	..	..	..	..	1 9·2-*in.*, 1 12-*pr.*, 2 M., and 1 6-*pr.* A.A.		12·5	32	69
,,	M 19 to M 27 *Pl. 26.*						Middlesboro'	Raylton Dixon	1915	1915												

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River Mon.	Humber (*ex* Solimões)																				
„	Mersey (*ex* Javary)	1260	266·9	49	5·8	1450 Y	Barrow	Vickers	1913	1914		2	..	..	..	..	..	3 *6-in.*, 2 *4·7-in.*, 4 *3-pr.*, and 1 *3-pr.* A.A.		12		100
„	Severn (*ex* Medeira) *Pl. 26.*																				
Mon.	M 29 to M 33 *Pl. 26.*	580	170	31	5·11	400	Belfast	Harland & Wolff	1915	1915		..	..	..	..	..	..	2 *6-in.*, 4 M., and 2 *6-pr.* A.A.		10	45 Oil	70
„	Erebus	8000	380	88	11	6000	Belfast	Harland & Wolff	1915	1916		4	2	..	4	13·8	..	2 *15-in.*, 4 *6-in.*, and 2 *3-in.* A.A.		12	750 Oil	200
„	Terror *Pl. 24.*																				
„	Gorgon (*ex* Nidaros)	4285	310	73	16	4000	Elswick	Hawthorn Leslie	1914	1918		..	..	..	..	..	..	2 *9·4-in.*, 6 *6-in.*, and 2 *3-pr.* A.A.		13		300

* One of these monitors was given 1 *18-in.* gun in place of her 2 *12-in.*, the gun being removed from the Furious.

The following Monitors were lost in the war:—Raglan (Abercrombie class), Glatton (Gorgon class), M 15, M 28 and M 30.

River Monitors.

Two classes of river gunboats have been added to the Navy during the war. The first class has a displacement of 640 tons, length 230 ft., beam 36 ft., draught 4 ft., H.P. 2000, speed 14 knots, armament, two 6-in., two 12-prs., six M.; fuel capacity, coal 35, oil 54 tons. Names:—Aphis, Bee, Cicala, Cockchafer, Cricket, Glowworm, Gnat, Ladybird, Mantis, Moth, Scarab and Tarantula. Particulars of the smaller class are:—Displacement 98 tons, length 120 ft., beam 20 ft., draught 2 ft., H.P. 175, speed 10 knots, armament, one 4-in., one 12-pr., one 2-pr. A.A.; fuel capacity, coal 5, oil, 10 tons. Names:—Firefly, Butterfly, Cranefly, Dragonfly, Gadfly, Grayfly, Greenfly, Mayfly, Sawfly, Snakefly, Stonefly, Waterfly, Blackfly, Caddisfly, Hoverfly and Sedgefly.

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GREAT BRITAIN.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt. / Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal. Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
Cr. . .	Active . .	3440	385	41½	13¾	18,000 Y.	Pembroke	Hawthorn. P.T.	1911	1911	272,977*	..	..	10 *4-in.* B.L., 4 *3-pr.*, and M.	2	26·0 *t*	350	320
„ . .	Adventure	2670	374	38¼	13½	15,850 Y mod.	Elswick .	Hawthorn.	1904	1905	270,263	2	¾	9 *4-in.* . . .	2	25·42 *t*	227	268
„ . .	Amethyst . .	3000	360	40	14½	14,200 Y mod.	Elswick .	Parsons P.T.	1903	1905	228,426	..	..	12 *4-in.*, 8 *3-pr.*, M. .	2	23·42 *t*	300	296
„ . .	Amphitrite shd.	11,000	435	69	25¼	18,000 B.	Barrow .	Vickers .	1898	1900	552,795	4	3–6 H. S.	16 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 2 M.	2 (1 sub.)	20·75	1000	677
„ . .	Argonaut . shd.	11,000	435	69	25¼	18,000 B.	Govan .	Fairfield .	1898	1900	545,756	4	3–6 H. S.	16 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 2 M.	2 (1 sub.)	20·75	1000	677
S C. . .	Argus . .	..	535	68	..	..	Dalmuir .	Beardmore	..	1918	..	..	..	4 *4-in.* A.A., 2 *4-in.* Q.F.	..	20¾	..	..
P. L. Cr. .	Aurora .						Devonprt	Parsons P.T.	1913	1914								
P. L. Cr. .	Inconstant						Dalmuir	Beardmore P.T.	1914	1914								
P. L. Cr. .	Galatea .						Dalmuir	Beardmore P.T.	1914	1914								
P. L. Cr. .	Penelope .	3500	410	39	14	40,000	Barrow .	Vickers . P.T.	1914	1914	289,000*	3	..	2 *6-in.*, 6 *4-in.* Q.F., 1 *4-in.* A.A., 1 M.	4	30	840 Oil.	270
P. L. Cr. .	Phaeton .						Barrow .	Vickers . P.T.	1914	1915								
P. L. Cr. .	Royalist .						Dalmuir	Beardmore P.T.	1915	1915								
P. L. Cr. .	Undaunted						Govan .	Fairfield . B.C.T.	1914	1914								
Cr. . .	Attentive .	2670	374	38¼	13½	16,212 Y.	Elswick .	Hawthorn .	1904	1906	270,263	2	¾	9 *4-in.* . . .	2	25·88 *t*	227	268

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Cr.	Bellona	3360	385	41½	13¾	18,000 Y.	Pembroke	Fairfield P.T.	1909	1910	283,038*	½–1	..	6 *4-in.* B.L., 4 *3-pr.*, and M.	2	25·9 *t*	450	263
P. L. Cr.	Birkenhead	5250	430	48	15	25,000	Birkenhead	Cammell Laird	1915	1915	300,000*	..	..	10 *5·5-in.*	..	25	Coal. Oil.	400
P. L. Cr.	Chester					31,000	Birkenhead	Cammell Laird	1915	1916						26·5	Oil.	400
Cr.	Birmingham	5440	430	49·10	15·10	26,500 Y.	Elswick	Hawthorn.	1912	1914	353,437*	..	..	9 *6-in.*, 4 *3-pr.*	2	25·5	650	400
,,	Blanche	3250	385	41½	13½	18,542 Y.	Pembroke	Hawthorn. P.T.	1909	1910	288,482*	..	..	10 *4-in.* B.L., 4 *3-pr.*, and M.	2	25·67 *t*	350	292
,,	Blonde	3350	385	41½	13½	18,770 Y.	Pembroke	Cammell Laird P.T.	1910	1911	267,754*	..	..	10 *4-in.* B.L., 4 *3-pr.*, and M.	2	25·43 *t*	350	292
,,	Boadicea	3300	385	41	13½	18,000 Y.	Pembroke	J. Brown P.T.	1908	1909	330,631*	½–1	..	6 *4-in.* B.L., 4 *3-pr.*, and M.	2	25·75 *t*	450	263
,,	Bristol	4800	430	47	15½	24,529 Y.	Clydeb'nk	J. Brown C.T.	1910	1910	364,953*	2–¾	..	2 *6-in.*, 10 *4-in.* B.L., 4 M.	2	26·84	650	376
L. Cr.	Courageous	18,600	735	81	22·3	90,000 Y.	Walker (Armstr'g)	Parsons	1916	1916	..	3	9–7	4 *15-in.*, 18 *4-in.*, 3 *3-in.* A.A., 5 M.	2	32	Oil	785
,,	Glorious (*b*) *Pl.* 12.						Belfast	Harland & Wolff							12		3250	
S. C.	Furious *Pl.* 13.	19,100	735	88	21·6	90,000	Walker (Armstrong)	Wallsend Engn'g Co.	1916	1917	1,920,000†	3	7	2 *18-in.*, 8 *5·5-in.*, 2 *3-in.* A.A, 4 *3-pr.*, 5 M. (*a*)	2	31·5	Oil	725
P. L. Cr.	Calliope	3750	420	41	13·6	40,000	Chath'm	Parsons P.T.	1914	1915	..	3	..	2 *6-in.*, 8 *4-in.* ‡	16	29	3400 Oil 900	287
,,	Caroline						Birkenhead	Cammell Laird P.T.	1914	1914					4			
,,	Carysfort						Pembroke	Hawthorn. B.C.T.	1914	1915								
,,	Champion						Newcastle (Hawth'rn)	Hawthorn. P.T.	1914	1915								
,,	Cleopatra						Devonport	Cammell Laird P.T.	1914	1915								
,,	Comus						Newcastle (Swan Hunter)	Wallsend Engn'g Co. P.T.	1914	1915								
,,	Conquest						Chatham	Scotts' P.T.	1914	1915								
,,	Cordelia *Pl.* 23.						Pembroke	Hawthorn. P.T.	1914	1915	..	3	1915	2 *6-in.*, 8 *4-in.* ‡	..	29	Oil 900	287

* Total estimated cost of ship including guns.
† Estimated cost as originally designed.
‡ Some of the vessels of this class have all 6-in. armament.
(*a*) Primary armament taken out when ship converted to a plane carrier.
(*b*) Also fitted as a minelayer.

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GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt. / Deck.	Armour. Gun Position	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal. / Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
P. L. Cr.	Cairo						Birkenhead	Cammell Laird	..	..								
„ „	Calcutta						Barrow	Vickers	..	..								
„ „	Cape Town	4190	425	43·6	14·6	40,000	Birkenhead	Cammell Laird	..	..	..	3	..	5 *6-in*, 2 *3-in.* A.A.	8	29	Oil 900	287
„ „	Carlisle						Govan	Fairfield	..	1918								
„ „	Colombo *Pl. 23.*						Govan	Fairfield	..	..								
„ „	Caledon						Birkenhead	Cammell Laird										
„ „	Calypso						Glasgow	Scotts'										
„ „	Caradoc	4120	425	42·9	14·6	40,000	Barrow	Vickers	..	1917	300,000	3	..	5 *6-in.*, 2 *3-in.* A.A.	8	29	Oil 900	287
„ „	Cassandra *Pl. 23.*						Newcastle	Hawthorn Leslie										
„ „	Cambrian						Pembroke	..	1915	1916								
„ „	Canterbury	3750	420	41·6	14·6	40,000	Clydebank	J. Brown	1915	1916	300,000†	3	..	5 *6-in.*, 2 *3-in.* A.A.	4	29	Oil 900	287
„ „	Castor						Birkenhead	Cammell Laird	1915	1915								
„ „	Constance *Pl. 23.*						Birkenhead	Cammell Laird	1915	1916								
„ „	Cardiff						Govan	Fairfield	..	1917								
„ „	Ceres						Clydebank	J. Brown	..	1917								
„ „	Coventry	4190	425	43·6	14·6	40,000	Newcastle (Swan Hunter)	Swan Hunter	..	1918	..	3	..	5 *6-in.*, 2 *3-in.* A.A.	8	29	Oil 900	287
„ „	Curacoa						Pembroke	..	..	1918								
„ „	Curlew *Pl. 23.*						Barrow	Vickers	..	1917								

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P. L. Cr.	Centaur	3750	420	42	13·6	40,000	Elswick	Armstrong	1915	1916	300,000†	3	..	5 6-*in.*	4	29	Oil 900	287
„	Concord *Pl. 23.*						Elswick	Armstrong										
Cr.	Chatham	5400	430	49¾	15¾	25,901 Y.	Chatham.	Thames Ironworks P.T.	1911	1912	349,358*	3 –	..	8 6-*in.*, 4 3-*pr.*, 4 M., 1 l.	2	25·5	650	400
„	Dartmouth	5250	430	48½	15½	23,467 Y.	Barrow	Vickers P.T.	1911	1911	329,406*	2–¾	..	8 6-*in.*, 4 3-*pr.*, 4 M.	2	25·9 *t*	650	390
P. L. Cr.	Daedalus	4750	445	46	14·3	40,000	Elswick	Armstrong	..	..	..	3	Shields	6 6-*in.*, 2 3-*in.* A.A.	12	29	Oil 1050	340
„ „	Daring						Dalmuir	Beardmore	..	..								
„ „	Despatch						Govan	Fairfield	..	..								
„ „	Diomede						Barrow	Vickers	..	..								
„ „	Dryad *Pl. 22.*						Barrow	Vickers	..	..								
„ „	Danae	4750	445	46	14·3	40,000	Elswick	Armstrong	..	1918	..	3	Shields	6 6-*in.*, 2 3-*in.* A.A.	12	29	Oil 1050	340
„ „	Dauntless						Jarrow	Palmer	..	1918								
„ „	Dragon *Pl. 22.*						Green'ck	Scott	..	1918								
„ „	Delhi	4750	445	46	14·3	40,000	Elswick.	Armstrong	..	..	..	3	Shields	6 6-*in*, 2 3-*in.* A.A.	12	29	Oil 1050	340
„ „	Dunedin						Elswick	Armstrong	..	..								
„ „	Durban *Pl. 22.*						Green'ck	Scott	..	..								
Cr.	Diamond	3000	360	40	14½	10,066 N. L.	Birkenh'd	Laird	1904	1905	231,010	..	..	12 4-*in.*, 8 3-*pr.*, M.	2	22·17 *t*	300	296
„	Dublin	5400	430	49·10	15¾	25,000 Y.	Dalmuir	Beardmore P. T.	1912	1913	337,565*	3 –	..	8 6-*in.*, 1 12-*pr.*, 4 3-*pr.*, 4 M., 1 l.	2	25·5	650	400
S.C.	Eagle, *ex* Almirante Cochrane (*a*)	..	..	..	..	..	Walker	..	..	..	..	..	..	..	..	..	..	..

* Total estimated cost of ship including guns. † Estimated cost as originally designed. (*a*) Particulars not yet available.

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GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal. Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
P. L. Cr.	Effingham	9750	565	65	17·3	60,000	Portsmouth	..	..	..	750,000†	3	Shields	7 7·5-*in.*, 8 *3-in.*, Q.F., 4 *3-in.*, A.A.	6	30	Oil 600	480
„ „	Frobisher						Devonport	..	..	..								
„ „	Hawkins						Chatham	..	..	..								
„ „	Raleigh *Pl. 20.*						Dalmuir	Beardmore	..	..								
S. C.	Vindictive‡ *ex* Cavendish *Pl. 21.*						Belfast	Harland & Wolff	..	1918								
Cr.	Fearless	3440	385	41·6	13·9	18,900	Pembroke	Beardmore P.T.	1912	1913	269,855	..	..	10 *4-in.*, 4 *3-pr.*	..	25·5	350	320
„	Fox shd.	4360	320	49½	19	9000	Portsm'th	Portsm'th	1893	1895	245,571	2–1	2	2 *6-in.*, 8 *4·7-in.*, 1 *12-pr.*, 13 *6-pr.*, *3-pr.*, M.	3	19·5	400	312
„	Foresight	2850	360	39	14	14,277 T.	Govan	Fairfield	1904	1905	285,672	1½–⅝	..	9 *4-in.*	2	25·12 *t*	250	268
„	Forward					15,018 T.					285,326					25·15 *t*		
P. L. Cr.	Glasgow	4800	430	47	15½	22,472 *t*	Govan	Fairfield P. T.	1909	1910	354,884*	2–¾	..	2 *6-in.*, 10 *4-in.*, 1 *12-pr.*, 4 *3-pr.*	2	25·8 *t*	650	376
„ „	Gloucester					23,757 *t*	Dalmuir	Beardmore P. T.			353,856*					26·29 *t*		
Cr.	Hermione shd.	4360	320	49½	13	9000	Devonp'rt	Thomson	1893	1895	223,324	2–1	2	2 *6-in.*, 8 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, M.	3	19·5	400	312

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P. L. Cr.	**Liverpool**	4800	430	47	15¼	24,614 Y.	Barrow	Vickers P.T.	1909	1910	344,871*	2–⅜	..	2 *6-in.*, 10 *4-in.* B.L., 4 *3-pr.*	2	26·17 *t*	650	376
Cr.	**Lowestoft**	5440	430	49	15	22,000	Chatham	Fairfield	1913	1914	375,162	..	..	9 *6-in.*, 4 *3-pr.*	2	25·5	650	..
P. L. Cr.	**Newcastle**	4800	430	47	15¼	24,669 Y.	Elswick	Wallsend Engineering Co. P.T.	1909	1910	352.610*	2–⅜	..	2 *6-in.*, 10 *4-in.* B.L., 4 *3-pr.*	2	26·26 *t*	650	376
Cr.	**Patrol**	2940	370	38⅜	14	L.N. 16,460	Birknhd.	Laird	1904	1905	273,523	½–⅝	..	9 *4-in.*	2	25·06 *t*	300	268
„	**Sapphire**	3000	360	40	14½	10,200	Jarrow	Palmer	1904	1905	226,277	..	..	12 *4-in.*, 8 *3-pr.*, M.	2	22·45 *t*	300	296
„	**Sentinel**	2895	360	40	14¼	17,488 Nor. V.E.	Barrow	Vickers	1904	1905	276,344	1½–⅝	..	9 *4-in.*	2	25·07 *t*	205	268
„	**Skirmisher**	2895	360	40	14¼	17,053 Nor.	Barrow	Vickers	1905	1905	276,579	1½–⅝	..	9 *4-in.*	2	25·19	205	268
„	**Southampton**	5400	430	49·10	15¾	25,000 Y.	Clydeb'nk	J. Brown C.T.	1912	1913	336,469*	3 – –	..	8 *6-in.*, 4 *3-pr.*, 4 M., 1 l.	2	25·5	650	400
„	**Topaze**	3000	360	40	14½	9860 L.N.	Birkenh'd	Laird	1903	1905	242,444	..	..	12 *4-in.*, 8 *3-pr.*, M.	2	22·1 *t*	300	296
„	**Weymouth**	5250	430	48½	15½	22,000 Y.	Elswick	Parsons P. T.	1910	1911	337,738*	2¾	..	8 *6-in.*, 4 *3-pr.*, 4 M.	2	25·5 *t*	650	390
„	**Yarmouth**						Glasgow	London & Glas. Co. C. T.	1911	1912	353,238*							

* Total estimated cost of ship, including guns. † Estimated cost as originally designed.
‡ Aeroplane Carrier, 3-7·5″ and 6 3″ removed.

The following classes of cruising ships have been struck out of the list as non-effective :—Diadem, Powerful, Edgar, Challenger, Highflyer, Pelorus, Arrogant, Talbot, Astraea, Apollo and Philomel. The Boadicea, Sentinel and Topaze classes have been retained for the present as some of these vessels are still in nucleus crew commission. There are a number of other vessels on the effective list which are being used for various purposes as repair ships, plane carriers, mine sweepers and other auxiliary work, including depôt ships for destroyers and submarines.

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Defence Forces of the Dominions.

AUSTRALIA.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.		in.			knots.	tons.	
b.c.	**Australia** *Pl.* 16.	18,800	555	80	26½	48,000	Clyde-bank	J. Brown P.T.	1911	1913	..	..		..	8 *12-in.*, 16 *4-in.*, 5 M.	2	26·0 *t*	1000	790
L. Cr.	**Adelaide**	5500	..	..	..	..	Building at Sydney	..	..	..	..	..		..	..	..	..	..	..
P. L. Cr.	**Melbourne**	5400	430	49½	15¾	25,500	Birken-head	Cammell Laird	1912	1913	..	..		..	8 *6-in.*, 4 *3-pr.*, 4 M., 1 l.	2	25·5	..	..
„ „	**Sydney**						Glasgow	London & Glasgow Co.	1912	1913									
„ „	**Brisbane**						Sydney	..	1915	..									
„ „	**Encounter**	5880	355	56	20¼	12,500 Dürr	Devonp'rt	Devonport Dockyard	1903	1906	370,275	3-2		..	11 *6-in.*, 9 *12-pr.*, 1 *3-pr.*, 2 M.	2	20·75	600	454

The Royal Australian Navy also includes the Cerberus, turret-ship, Platypus, submarine depôt ship, and several old cruisers and sloops which were lent for service during the war, as well as certain armed patrol vessels taken up for the same purpose. Torpedo Craft are given in the Tables of British and Foreign Flotillas.

CANADA.

Cr.	**Niobe**	11,000	435	69	26	16,500	Barrow	Vickers	1897	1899	..	..		..	16 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 2 M.	2	20·5	1000	600
„	**Rainbow** shd.	3600	300	43¾	17½	9000	Jarrow	Palmer	1891	1893	..	..		..	2 *6-in.*, 6 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·7	400	273

The Royal Canadian Navy has no effective ships of the larger classes, the above vessels being lent for training purposes. There are other small craft used for miscellaneous and special service during the war.

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ARGENTINE REPUBLIC.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Garibaldi** . .	6732	328	59¾	24	13,384	Sestri Ponente	1895	1896	752,000	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 M.	2	19·9 *t*	1000	500
a.c.	**General Belgrano** .	7069	328	59¾	24	13,000	Leghorn .	1897	1899	696,700	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 14 *6-in.*, 2 *3-in.*, 4 *2·2-in.*, 2 L., 2 M.	4	20·1 *t*	1000	500
a.c.	**General San Martin**	6773	328	59¾	24	13,000	Leghorn .	1896	1898	688,200	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	4 *8-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 L., 2 M.	4	19·8	1100	500
b. *Pl. 29.*	**Moreno** . . / **Rivadavia** .	27600*	585	98		27½	39,500 B. & W. / Curtist.	Camden, N.J. (N.Y.S.B.Co.) / Quincy, Mass.	1911	1914	2,200,000	12–10 K.S.	3-2	9–6 K.S.	9 K.S.	12–9 K.S.	6 K.S.	12 *12-in.*, 12 *6-in.*, 16 *4-in.*, 10 smaller.	2 sub.	22·5 *t*	1600 / 4000	1046
a.c.	**Pueyrredon** . .	6773	328	59¾	24	13,000 B.	Sestri Ponente	1898	1901	782,000	6–3 H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 M.	4	20·1 *t*	1000	500

* Normal; 30,000 tons full load; oil fuel 600 tons.

The old coast-defence ironclads Libertad and Independencia, 2336 tons, completed at Birkenhead respectively in 1892 and 1893, are still retained, but possess little value. They carry two 9·4-in., four 4·7-in., and four 3-pr. guns.

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ARGENTINE REPUBLIC.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr. . .	**Buenos Aires**	4780	396	47½	19	17,000	Elswick .	1895	1895	383,000	..	4½	2 *8-in.* (A.), 4 *6-in.*, 6 *4·7-in.*	3	23·2 *t*	1000	429
riv. g.b. .	**Paraná** . .	1000	240	32½	7½	..	Elswick .	1908	1909	..	1	3–2*	2 *6-in.* Howitzers, 6 *12-pr.*, 8 M., 4 *12-pr.* field.	..	15·0	120	150
riv. g.b. .	**Patria** . .	1070	250	31	10	4500	Birkenhead .	1893	1894	87,000	..	..	2 *4·7-in.*, 4 *8-pr.*, 2 *3-pr.*, 2 M.	5	20·75 *t*	288	159
riv. g.b. .	**Rosario** . .	1000	240	32½	7½	..	Elswick .	1908	1909	..	1	3–2*	2 *6-in.* Howitzers, 6 *12-pr.*, 8 M., 4 *12-pr.* field.	..	15·0	120	150

* Side.

The training-ship (cruiser) Presidente Sarmiento, 2750 tons, 2000 I.H.P., and 13 knots speed, with 19 guns and three torpedo tubes; launched by Messrs. Laird, 1897. There are also the old cruiser Nueve de Julio, 3570 tons, completed at Elswick 1902, and several small gunboats and torpedo-gunboats.

A programme was introduced in the Argentine Senate providing for considerable reorganisation and the augmentation of the resources of the Navy, the improvement of the shore establishments, the building or acquisition of 4 scout cruisers, 8 destroyers of 1000 tons, 20 submarines, a training and a hospital ship, and several transports and auxiliaries—the money to be raised by the issue of 5 per cent. bonds.

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The Fleet of AUSTRIA-HUNGARY at the close of Hostilities.—Armoured Ships.

This table and that which follows are given as a record of the ships and vessels of the late Imperial and Royal Navy, now at the disposition of the Peace Conference. Under the Naval conditions of the Armistice, three battleships, three light cruisers, nine destroyers, twelve torpedo boats, one minelayer, and six Danube monitors were to be surrendered to the Allies. (See Part IV.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal	Complement.
		tons.	ft.	ft.	ft.						in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	Arpád Babenberg	8208	354½	65¾	23½	15,000 B.	Trieste	1901 1902	1903 1904	650,900 667,000	8½ K.S.	2½	4 K.S.	8 K.S.	8¼ K.S.	5 K.S.	3 *9·4-in.*, 12 *5·9-in.*, 10 *2·8-in.*, 8 M., 2 l.	2 (sub)	19·6 *t*	500 840	638
b. *b.* *b.*	Erz. Friedrich Erz. Karl Erz. Ferdinand Max *Pl. 31.*	10433	390½	72½	24½	18,130 *t* 18,000 Y.	Trieste	1904 1903 1905	1906 1905 1907	912,500	8¼ K.S.	3	5 K.S.	8 K.S.	9¼ K.S.	7 K.S.	4 *9·4-in.*, 12 *7·5-in.*, 12 *2·8-in.*, 6 *1·8 in.*, 8 M., 2 l.	2 sub.	20·56 *t* 20·36 *t* 20·0	1315	875
b.	Erz. Franz Ferdinand *	14226	450¾	80½	26½	20,600 Y. *t*	Trieste	1908	1910	..	9–7½ K.S.	2	6 K.S.	6 K.S.	10 K.S.	8 K.S.	4 *12-in.*, 8 *9·4-in.*, 20 *3·9-in.*, 6 *12-pr.*, 2 M.	3 sub.	20·6 *t*	750 1200	816
b.	Habsburg *Pl. 31.*	8208	354¼	65¾	23¼	15,000 B.	Trieste	1900	1902	626,000	8½ H.S.	2½	4 H.S.	8 H.S.	8¼ H.S.	5 H.S.	3 *9·4-in.*, 12 *5·9-in.*, 10 *2·8-in.*, 8 M., 2 l.	2 (sub)	19·6 *t*	500 840	638
a.c	Kaiser Karl VI.	6151	367½	56	20¼	12,800 B.	Trieste	1898	1900	429,000	10 H.S.	1½	6 H.S.	8 H.S.	8¾ H.S.	6 H.S.	2 *9·4-in.*, 8 *5·9-in.*	4	20·7 *t*	800	535
b.	Prinz Eugen *Pl. 30.*	20000	495	89½	27	25,000 P. tur. Y.	Trieste	1912	1915	2,500,000	11–4¾ K.S.	2½	6 K.S.	..	12 K.S.	6 K.S.	12 *12-in.*, 12 *5·9-in.*, 18 *12-pr.*, 6 smaller	4 (sub)	20·5	900 2000	1000
b.	Radetzky *Pl. 31.*	14226	450¾	80½	26½	20,000 Y.	Trieste	1909	1911	..	9–7½ K.S.	2	6 K.S.	6 K.S.	10 K.S.	8 K.S.	4 *12-in.*, 8 *9·4-in.*, 20 *3·9-in.*, 6 *12-pr.*, 2 M.	3 (sub)	20·5	750 1200	816
a. c.	St. Georg	7185	383¾	61¾	21¼	15,270 *t*, Y. 25,000	Pola	1903	1906	581,583	8¼–6½ K.S.	1½	5 K.S.	7 K.S.	8¼–5¼ K.S.	6 K.S.	2 *9·4-in.*, 5 *7·5-in.*, 4 *5·9-in.*	2 (sub)	22 *t*	1000	628
b.	Tegetthoff * *Pl. 30.*	20000	495	89½	27	A.E.G. tur. 25,000 P. tur. Y.	Trieste	1912	1913	2,500,000	11–4¾ K.S.	2½	6 K.S.	..	12 K.S.	6 K.S.	12 *12-in.*, 12 *5·9-in.*, 18 *12-pr.*, 6 smaller	4 (sub)	20·7 *t*	900 2000	1000
b.	Zrinyi *Pl. 31.*	14226	450¾	80½	26½	20,000 Y.	Trieste	1910	1911	..	9–7½ K.S.	2	6 K.S.	6 K.S.	10 K.S.	8 K.S.	4 *12-in.*, 8 *9·4-in.*, 20 *3·9-in.*, 6 *12-pr.*, 2 M.	3 sub.	20·5	750 1200	816

* The Tegetthoff and Franz Ferdinand were brought to Venice by the Italians.

The battleships Szent Istvan, torpedoed 10th June, 1918, and Viribus Unitis, sunk 1st November, 1918, were sister ships of the Prinz Eugen. The ante-bellum programme included four battleships of 24,500 tons. The lighter armament was removed from the Kaiser Karl VI. and St. Georg. There were four armoured river monitors, Bodrog, Maros, Leitha, and Szamos, of 300–437 tons displacement, two 4·7-in. guns—Maros and Leitha one only, Bodrog one 4·7-in. howitzer additional—also the Almos, Sava and Ragusa. The Temes, Körös and Inn were sunk. The other monitors were surrendered and taken by British officers to Belgrade.

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The Fleet of AUSTRIA-HUNGARY at the close of Hostilities.—Cruising Ships, &c.

This table gives the light cruisers of the former Austro-Hungarian Empire as existing at the close of the hostilities.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
to. cr.	**Admiral Spaun***	3500	416¾	42	15½	21,000 Y. tur.	Pola	1909	1910	..	1	..	7 *3·9-in.*, 2 M.	2	26·0	450 850	320
to. cr.	**Aspern**	2362	301¾	39½	14¼	7300 Y	Pola	1899	1901	155,000	2	..	8 *4·7-in.*, 8 *1·8-in.*, 4 M.	1	20·0	470 500	305
to. cr.	**Helgoland***	3500	416¾	42	15½	25,000 Tur.	Fiume	1912	1914	..	1	..	9 *3·9-in.*, 4 smaller	2	27·0	450 850	320
to. g. b.	**Magnet**	502	220	26¾	8	5000 T	Elbing	1896	1899	51,052	..	..	6 *1·8-in.*	3	26·0 *t*	105	80
to. cr.	**Novara***	3500	416¾	42	15½	25,000 Tur.	Fiume	1913	1914	..	1	..	9 *3·9-in.*, 4 smaller	1	27·0	450 850	320
to. cr.	**Saida***	3500	416¾	42	15½	25,000 Tur.	Monfal-cone	1912	1914	..	1	..	9 *3·9-in.*, 4 smaller	1	27·0	450 850	320
to. cr.	**Szigètvár**	2313	301¾	39½	14¼	7300 Y.	Pola	1899	1901	155,000	2	..	8 *4·7-in.*, 8 *1·8-in.*, 4 M.	1	20·0	470 500	305
to. g. b.	**Trabant**	522	220	23	8¼	3500	Trieste	1890	1891	..	..	..	2 *2·8-in.*, 8 *1·8-in.*	1	20·0	..	84

* 2½ in. side armour and 2 in. bulkhead. The Saida was brought to Venice.

Mining vessels, Chamäleon, 1000 tons, Satellit, 531 tons, Basilisk, 304 tons, and Dromedar, 173 tons. Pelikan, 2431 tons, submarine tender. **Donau, training corvette (2307 tons). A submarine depôt and salvage vessel, 950 tons, 15 knots. Tender and repair ship for flotillas, Gaea (*ex* Fürst Bismarck). Fleet colliers, Pola and Teodo, 7000 tons.**

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BRAZIL.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal	Complement.
											Belt.	Deck.	Side above Belt.	Bulkheads.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s., t.	**Marshal Deodoro**	3112	267½	48	13¼	3400 D'A.	La Seyne	1898	1900	..	13¾–4 H.S.	1½	..	..	8 H.S.	3 H.S.	2 *9·4-in.*, 4 *4·7-in.*, 2 M., 4 *6-pr.*, 2 *1-pr.*	2 (sub.)	15·0	236	200
c.d.s., t.	**Marshal Floriano**							1899	1901												
b.	**Minas Geraes** *Pl. 32.*	19,281	500	83	25	27,212 *t* B.&W.	Elswick	1908	1909	1,821,400	9–6–4 K.S.	2	9–6–4 K.S.	9	12–8 K.S.	9 K.S.	12 *12-in.*, 22 *4·7-in.*, 8 *3-pr.*	4	21·4 *t*	900 2400	900
b.	**São Paulo** *Pl. 32.*	19,281	500	83	25	28,645 *t* B.&W.	Barrow	1909	1910	1,821,400	9–6–4 K.S.	2	9–6–4 K.S.	9 K.S.	12–8 K.S.	9 K.S.	12 *12-in.*, 22 *4·7-in.*, 8 *3-pr.*	4	21·6 *t*	900 2400	900

Also river monitors Maranhao and Pernambuco, built at Rio de Janeiro.
The battleship Rio de Janeiro, 27,500 tons, built at Elswick, was on the outbreak of war added to the British Navy, and named Agincourt.

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BRAZIL.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Bahia	3100	380	39	13½	17,500 tur.	Elswick	1909	1910	328,500	¾–1½	..	10 *4·7-in.*, 8 *1·8-in.*	2	27·0 *t*	650	260
„	Barroso	3600	330	43¾	16¾	7500	Elswick	1896	1897	..	3	4½ shields	6 *6-in.*, 4 *4·7-in.*, 10 *6-pr.*, 4 *1-pr.*, 4 M.	3	20·0	700	300
„	Benjamin Constant	2707	236	46	18	2800	La Seyne	1892	1894	..	2	..	4 *6-in.*, 8 *4·7-in.*, 8 M., 4 l.	4	14·0	260	287
„	Republica *	1300	210	35	13	750	Elswick.	1892	1894	..	2–1	..	6 *4·7-in.*, 4 *6-pr.*, 6 M.	4	17·0	170	160
„	Rio Grande do Sul	3100	380	39	13½	17,500 tur.	Elswick	1909	1910	328,500	..	..	10 *4·7-in.*, 8 *1·8*-in.	2	27·4 *t*	650	260
to.cr.	Tamoyo	1063	269	28¾	9¾	6500	Kiel	1898	1900	..	..	4½ shields	2 *4·1-in.*, 6 *2·2-in.*, 2 *1·4-in.*, 2 M.	3	23·0	293	110
„	Timbira	1014	249½	30¾	10¼	7000	Kiel	1896	1897	..	½	4½ shields	2 *4·1-in.*, 6 *2·2-in.*, 2 *1·4-in.*, 2 M.	3	22·5	250	110
„	Tupy	1014	249½	30¾	10¼	7000	Kiel	1896	1897	..	½	4½ shields	2 *4·1-in.*, 6 *2·2-in.*, 2 *1·4-in.*, 2 M.	3	22·5	250	110

Four 12-knot river gunboats Missões and Acre and two others, built at Poplar, in 1907, by Messrs. Yarrow, were sent out in sections.

Almirante Tamandare (launched 1890), 4660 tons, gunnery ship. Tiradentes (189), 800 tons, training ship.

* Converted into a mine-layer.

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CHILE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
a.c.	**O'Higgins** . . .	8,500	411¾	62½	22	16,000 B.	Elswick .	1897	1898	..	7–5	2	..	..	7½–6	6	4 *8-in.*, 10 *6-in.*, 4 *4·7-in.*, 10 *12-pr.*, 10 *6-pr.*, 4 M.	3 (2 sub.)	21·5 *t*	1260	500
b.	**Capitan Prat** . . .	5,981	328	60¾	21¾	12,000	La Seyne	1890	1893	391,000	12	3	4	..	10½	2	4 *9·4-in.* (Canet), 8 *4·7-in.* (Canet), 10 *12-pr.*, 14 smaller and M.	4	18·3 *t*	775	480
a.c.	**Esmeralda** . . .	7,020	436	53¼	22¼	16,000	Elswick .	1896	1897	..	6 H.S.	2	..	6 H.S.	4½ Shields	..	2 *8-in.*, 16 *6-in.*, 8 *12-pr.*, 2 *3-pr.*, 4 M.	3 (2 sub.)	22·8 *t*	1350	500

Capitan Prat reconstructed.

Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.			knots.	tons.	
cr	**Blanco Encalada** . .	4400	370	46½	18½	14,500	Elswick . .	1893	1894	..	4–1¾	..	2 *8-in.*, 10 *6-in.*, 12 *3-pr.*, 10 *1-pr.**	5	22·78 *t*	900	427
„	**Chacabuco** . . .	4500	360	46	18	15,750	Elswick . .	1901	1903	..	4½–1¾	..	2 *8-in.*, 10 *4·7-in.*, 16 *1·8-in.*, 2 M., 1 l.	5	23·0	1000	350
„	**General Baquedano** (Training)	2330	240	45¾	18	1500 B.	Elswick . .	1898	1900	..	..	..	4 *4·7-in.*, 2 *12-pr.*, 2 *6-pr.*, 2 M., 1 l.	1	13·7 *t.*	300	302
„	**Ministro Zenteno** . .	3600	330¼	43¾	16¾	6500	Elswick . .	1896	1898	..	..	..	8 *6-in.*, 10 *6-pr.*, 4 *1-pr.** .	3	20·0 *t*	800	280
„	**Presidente Errázuriz** .	2047	268	35¾	19½	5400	La Seyne .	1890	1892	..	3½	..	4 *6-in.* (Canet), 2 *5-in.*, 4 *2·2-in.*, 6 M.	3	19·0	200	171

* Armstrong.

Transports: Maipo, 11,000 tons; Rancagua, 10,000 tons; Aguila, 600 tons; Porvenir, 300 tons. Sloops: Yanez, Yelcho, Huemul, Condor, 100 to 250 tons.

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CHINA.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.			kts.	tons.	
l.cr.	Chao-Ho	2600	330	42	13¼	6500 P tur	Elswick	1911	1912	..	¾	..	2 *6-in.*, 4 *4-in.*, 2 *3-in.*, 6 *3-pr.*, 2 l.	2	22·0	150 600	330
„	Hai-Chi.	4300	396	46¾	18½	17,000	Elswick	1898	1899	..	5	6	2 *8-in.*, 10 *4·7-in.*, 12 *3-pr.*, 4 *1·4-in.*, 6 M.	5	24·0	300	374
„	Hai-Shen	2954	314¾	41	16	7500	Vulcan	1898	1898	..	3	2	3 *6-in.* (K.), 8 *4-in.*, 6 *1·4-in.* Hotchkiss, 6 M.	3 (1 sub.)	20·7 *t*	220 500	244
„	Hai-Chew						Stettin	1897	1898								
„	Hai-Yung							1897	1898								
to.cr.	Kien-Wei	871	256	26½	11	6500 N.S.	Foochow	1900	1902	..	..	..	1 *3·9-in.*, 3 *2·5-in.*, 6 *1·4-in.*	2	13·5	360	280
„	Kien-An						Foochow	1899	1902								
g.v.	Tung-Chi	1900	330	40	18	1600	Foochow	1892	1893	..	..	..	2 *6-in.*, 5 *4·7-in.*, 2 *6-pr.*	..	10·0	..	280
cr.	Ying-Swei	2600	330	42	13½	6000	Barrow	1911	1912	..	¾	..	2 *6-in.*, 4 *4-in.*, 2 *3-in.*, 6 *3-pr.*, 2 l.	2	22·0	150 600	330

Yung-Fang, Yung-Chon, Yung Kien, Yung Tsih, 800 tons, 13·5 knots, one 4-in. and smaller guns, Yangtsze gunboats, built in Japan and at the Kiang-Nan dockyard, 1912–1918. Two river gunboats of 150 tons built at the Germania Yard, Kiel. At the Kawasaki Yard, Kobe, six gunboats, 740 tons, two 4·7-in. guns, and four of 550 tons, one 4·7-in., were built 1905–8. Seven light draft gunboats. Admiralty yacht Wufeng, 500 tons, 14 knots, built at Kiao-chau.

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DENMARK.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Fuel.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s.,t.	**Herluf Trolle** .	3650	233½	49¼	16¼	4400 T.	Copenhagen	1899	1901	..	8–7 H.S	2¼	..	7½ H.S.	7 H.S.	5½ K.S.	2 *9·4-in.*, 4 *5·9-in.*, 6 *3-in.* A.A., 4 smaller.	3 (sub.)	16·0	245	250
c.d.s.,t.	**Niels Juel** .	3900	295	53½	15¼	5500	Copenhagen	1918	..	..	8–6 K.S.	2	..	6¾ K.S.	7½ K.S.	3 K.S.	2 *9·4-in.*, 4 *5·9-in.*, 6 *3-in.* A.A., 4 smaller.	2 (sub.)	16	220	250
c.d.s.,t.	**Olfert Fischer** .	3700	283½	50¼	16½	4600	Copenhagen	1903	1905	..	8–6 K.S.	2½	..	..	7½ K.S.	5½ K.S.	2 *9·4-in.*, 4 *5·9-in.*, 6 *3-in.* A.A.	3 (sub.)	16·0	250	250
c.d.s.,t.	**Peder Skram** .	3800	285½	51½	16¼	5400	Copenhagen	1908	1909	..	8–6 K.S.	2½	..	..	7½ K.S.	5½ K.S.	2 *9·4-in.*, 4 *5·9-in.*, 6 *3-in.* A.A.	3	16·0	255	250
c.d.s.,t.	**Skjold** . .	2200	239¼	38	13½	2400 T.	Copenhagen	1896	1897	..	9–7	2	..	..	8	4¾	1 *9·4-in.*, 3 *4·7-in.* 4 *2·2-in.*, 1 M.	..	13·0	120	130

DENMARK.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.				tons.	
l. cr.	**Geiser** . . .	1300	237	34	11¼	3100 T.	Copenhagen .	1892	1893	..	1½	..	2 *4·7-in.*, 4 *3-in.* A.A., 6 smaller.	2	17·1 *t*	140	156
„	**Heimdal** . .	1300	237	34	11¼	3100 T.	Copenhagen .	1894	1895	..	1½	..	2 *4·7-in.*, 4 *3-in.* A.A., 6 smaller.	2	17·0	140	156

Also the older cruisers Valkyrien, 3000 tons, and Hekla, 1260 tons.

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FRANCE.—Armoured Ships.

Class.	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Aube** (Amiral) *Pl. 39.*	9637	453	66¼	24½	22,155 *t.* B.	St. Nazaire	1902	1904	973,440	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 7·6-*in.*, 8 6·4-*in.*, 6 3·9-*in.*, 20 small Q.F. and M.	2 (sub.)	21·9 *t*	970 1590	615
b.	**Béarn*** *Pl. 33.*	25,230	579	88½	29	36,000 T. Nic.	La Seyne	1915	..	..	11–7 K.S.	2¾	7 K.S.	..	12 K.S.	7 K.S.	12 13·4-*in.* (3 turrets), 24 5·5-*in.*, 4 3-*pr.*	6 (sub.)	21·0	900 2700	1204
b.	**Bretagne** *Pl. 34.*	23,177	546	88½	29	29,000 tur.	Brest	1913	1915	2,589,439	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 13·4-*in.*, 22 5·5-*in.*, 8 small Q F. and M.	4 (sub.)	20·0	900 2700	1167
a.c.	**Condé** *Pl. 39.*	10,397	453	63¾	24½	22,175 Nic.	Lorient	1902	1904	863,799	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 7·6-*in.*, 8 6·4-*in.*, 6 3·9-*in.*, 18 1·8-*in.*	2 (sub.)	21·4 *t*	970 1590	615
b.	**Condorcet.** *Pl.36.*	18,890	481	84	27	22,500 N. tur.	St. Nazaire	1909	1911	2,165,200	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾ K.S.	4 12-*in.*, 12 9·4-*in.*, 16 12 *pr.*, 8 3-*pr.*, 2 1-*pr.*	2 (sub.)	19·8 *t*	960 2010	690
b.	**Courbet** *Pl. 35.*	23,100	546	88½	29	28,000 N. tur.	Lorient	1911	1913	2,508,388	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	12 12-*in.*, 22 5·5-*in.*, 4 3-*pr.*	4 (sub.)	20·0	900 2700	998
b.	**Démocratie** *Pl. 36.*	14,635	444	79½	27½	19,190 B.	Brest	1904	1907	1,473,180	11–7 H.S.	2¾	8 H.S.	..	12 H S.	6 H.S.	4 12-*in.*, 10 7·6-*in.*, 28 1·8-*in.*	2 (sub.)	19·44 *t*	905 1285	793
a.c.	**Desaix** shd.	7578	433	58¼	24¼	17,860 *t* B.	St. Nazaire	1901	1903	762,759	4–3 H.S.	2¾	..	..	3½ H.S.	..	8 6·4-*in.*, 4 3·9-*in.*, 10 3-*pr.*	2	21·7 *t*	880 1200	531
b.	**Diderot** Pl. 36.	18,863	476	84	27	22,500 N. tur.	St. Nazaire	1909	1911	2,167,000	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾	4 12-*in.*, 12 9·4-*in.*, 16 12-*pr.*, 8 3-*pr.*, 2 1-*pr.*	2 (sub.)	19·75 *t*	960 2010	690
a c.	**Dupleix** shd.	7552	433	58¼	24¼	17,100 B.	Rochefort	1900	1903	652,354	4–3 H.S.	2¾	..	..	3½ H.S.	..	8 6·4-*in.*, 4 3·9-*in.*, 10 3-*pr.*	2	21·0	880 1200	531

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a.c.	**Edgard Quinet**	14,100	521	70½	27½	39,803 *t*	Brest B.	1907	1911	1,307,536	6½–3½ K.s.	2½–1¼	5–2 K.s.	4¾ K.s.	8 K.s.	4¾ K.s.	14 *7·6-in.*, 20 *2·4-in.*, 2 smaller.	2 (sub.)	23·9 *t*	1242 2300	738
a.c.	**Ernest Renan** *Pl.* 38.	13,427	515	70½	26½	37,500	St. Nazaire Nic., *t*	1906	1909	1,410,000	6¾–4 H.s.	2	5–3 H.s.	4¾	6 H.s.	5 H.s.	4 *7·6-in.*, 12 *6·4-in.*, 16 *9-pr.*, 8 *3-pr.*	2 (sub.)	25·5 *t*	1354 2300	674
b.	**Flandre*** *Pl.* 33.	25,230	574¼	88½	28¼	34,800	Brest P.	1914	..	2,589,439	11–7 K.s.	2¾	7 K.s.	..	12 K.s.	7 K.s.	12 *13·4-in.* (3 turrets), 24 *5·5-in.*, 4 *3-pr.*	6 (sub.)	21·0	900 2700	1204
b.	**France** *Pl.* 35.	23,100	546	88½	29	28,000	St. Nazaire N. tur.	1912	1916	2,603,920	11–7 K.s.	2¾–1¾	7 K.s.	7 K.s.	10½ K.s.	7 K.s.	12 *12-in.*, 22 *5·5-in.*, 4 *3-pr.* Q.F. and M.	4 (sub.)	20·0	900 2700	998
b.	**Gascogne*** *Pl.* 33.	25,230	574¼	88½	28¼	34,800	Lorient P.	1914	..	2,589,439	11–7 K.s.	2¾	7 K.s.	..	12 K.s.	7 K.s.	12 *13·4-in*, 24 *5·5-in.*, 4 *3-pr.*	6 (sub.)	21·0	900 2700	1204
a.c.	**Gloire** *Pl.* 39.	10,376	460	66	25½	20,500	Lorient Nic.	1900	1904	883,269	6–4 H.s.	2	5–2 H.s.	..	7½ H.s.	6½–5 H.s.	2 *7·6-in.*, 8 *6·4-in.*, 6 *3·9-in.*, 16 *1·8-in.*, 6 *1·4-in.*	2 (sub.)	21·0	970 1590	615
a.c.	**Gueydon** (Amiral) *Pl.* 39.	9367	459	63¾	24½	20,200	Lorient Nic.	1899	1902	817,994	6–3¾ H.s.	2	3¾ H.s.	6 H.s.	6 H.s.	3¾ H.s.	2 *7·6-in.*, 8 *6·4-in.*, 4 *3·9-in.*, 18 *3-pr.*	2 (sub.)	21·0	1020 1600	610
b.	**Henri IV.** *Pl.* 37.	8807	354½	72	23	11,500	Cherbourg. Nic.	1899	1902	801,248	11–7 H.s.	3	4¾ H.s.	..	11¾ H.s.	5 H.s.	2 *10·8-in.*, 7 *5·5-in.*, 12 *1·8-in.*, 2 M.	2 (sub.)	17·2 *t*	735 1100	464
b.	**Jean Bart** *Pl.* 35.	23,467	546	88½	29	28,000	Brest B. tur.	1911	1913	2,528,888	11–7 K s.	2¾–1¾	7 K.s.	7 K.s.	10½ K.s.	7 K.s.	12 *12-in.*, 22 *5·5-in.*, 4 *3-pr.*	4 (sub.)	22·0	900 2700	998
a.c.	**Jeanne d'Arc**	11,300	489¼	63¾	26½	29,690	Toulon Guyot	1899	1903	875,847	6–3 H.s.	2·2	3 H.s.	..	6 H.s.	5 H.s.	2 *7·6-in.*, 14 *5·5-in.*, 16 *3-pr.*, 8 *1·4 in.*, 2 M.	2 (sub.)	21·7 *t*	1400 2000	626
„	**Jules Ferry** *Pl.* 38.	12,351	487	70¼	27	30,500	Cherbourg Guyot	1903	1906	1,169,940	6¾–4 H.s.	2	5–3 H.s.	6	6 H.s.	5 H.s.	4 *7·6-in.*, 16 *6·4-in.*, 24 *3-pr.*	2 (sub.)	22·8 *t*	1320 2100	728
„	**Jules Michelet.**	13,370	489½	70¼	27	27,700	Lorient Guyot	1905	1908	1,204,107	6–4 K.s.	2	5–3 K.s.	6 H.s.	8 K.s.	5 K.s.	4 *7·6-in.*, 12 *6·4-in.*, 24 *1·8-in.*, 2 *1·4-in.*	2 (sub.)	23·2 *t*	1320 2100	724

* Work on these ships was suspended.

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FRANCE.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.		ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
b.	**Justice** . *Pl. 36.*	15,090	443	79½	27½	18,548 Nic. *t.*	La Seyne .	1904	1907	1,670,385	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 10 *7·6-in.*, 13 *2·5-in.*, 10 *3-pr.*	2 (sub.)	19·43 *t*	905 1825	793
b.	**Languedoc*** *Pl. 33.*	25,231	579	88½	28¼	34,800 S.	Bordeaux .	1915	..	2,642,439	11–7 K.S.	2¾	7 K.S.	..	12 K.S.	7 K.S.	12 *13·4-in.* (3 turrets), 24 *5·5-in.*, 4 *3-pr.*	6 (sub.)	21·5	900 2700	1204
b.	**Lorraine** . *Pl. 34.*	23,549	546	88½	29	29,000 tur. S. & cyl.	St. Nazaire	1913	1915	2,642,439	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 *13·4-in.*, 22 *5·5-in.*, 8 small Q. F. & M.	4 (sub.)	20·0	900 2700	1167
a.c.	**Marseillaise** *Pl. 39.*	9611	460	66	25½	21,500 B.	Brest .	1900	1903	881,270	6 4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 *7·6-in.*, 8 *6·4-in.*, 6 *3·9-in.*, 2 *2·5-in.*, 18 *1·8-in.*, 6 *1·4-in.*	2 (sub.)	21·0	970 1580	615
b.	**Mirabeau** *Pl. 36.*	18,741	481	84	27	22,500 B. tur.	Lorient .	1909	1911	2,032,000	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾ K.S.	4 *12-in.*, 12 *9·4-in.*, 16 *12-pr.*, 8 *3-pr.*, 2 *1-pr.*	2 (sub.)	19·73 *t*	960 2010	690
a.c.	**Montcalm** . *Pl. 39.*	9367	459	63¾	24½	19,600 N.S.	La Seyne .	1900	1902	902,809	6 H.S.	2	3¾ H.S.	6 H.S.	6 H.S.	2¾ H.S.	2 *7·6-in.*, 8 *6·4-in.*, 4 *3·9-in.*, 16 *8-pr.*	2 (sub.)	21·0	1020 1600	612
b.	**Normandie*** *Pl. 33.*	25,231	579	88½	28¼	34,800 P.	St. Nazaire	1914	..	2,642,439	11–7 K.S.	2¾	7 K.S.	..	12 K.S.	7 K.S.	12 *13·4-in.* (3 turrets), 24 *5·5-in.*, 4 *3-pr.*	6 (sub.)	21·5	900 2700	1204
b.	**Paris** . *Pl. 35.*	23,467	546	88½	29	28,000 N. tur.	La Seyne .	1912	1914	2,603,920	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	12 *12-in.*, 22 *5·5-in.*, 4 *3-pr.*, Q. F. & M.	4 (sub.)	20·0	900 2700	998
b.	**Patrie** . *Pl. 37.*	15,141	444	79½	27½	17,859 *t.* Nic.	La Seyne .	1903	1906	1,674,870	11–7 F.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 18 *6·4-in.*, 13 *1·8-in.*, 10 *1·4-in.*	2 (sub.)	19·12 *t*	905 1825	793

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b.	**Provence** *Pl. 34.*	23,549	546	88½	29	29,000 tur.	Lorient	1913	1915	2,600,195	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 *13·4-in.*, 22 *5·5-in.*, 4 *3-pr.*, 8 small Q.F. and M.	4 (sub.)	20·0	900 2700	1167
b.	**République** *Pl. 37.*	14,635	444	79½	27½	19,626 *t.*	Brest Nic.	1902	1906	1,523,136	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 18 *6·4-in.*, 13 *1·8-in.*, 10 *3-pr.*	2 (sub.)	19·15	905 1625	793
b.	**Saint Louis** *Pl. 37.*	11,284	385½	66½	27½	14,500 B.	Lorient	1896	1900	1,080,997	15¾ H.N.	3½	3 H.N.	..	3–15¾ H.N.	3 H.N.	4 *12-in.*, 10 *5·5-in.*, 8 *3·9-in.*, 10 *3-pr.*, 8 M.	2 (sub.)	18·0	820 1150	631
b.	**Vergniaud** *Pl. 36.*	18,890	481	84	27	22,500 N. tur.	Bordeaux	1910	1911	2,165,200	10–8 K.S	2¾	8¾	..	12 K.S.	8¾ K.S.	4 *12-in.*, 12 *9·4-in.*, 16 *12-pr.*, 8 *3-pr.*, 2 *1-pr.*	2 (sub.)	19·67 *t*	960 2010	690
b.	**Vérité** *Pl. 36.*	14,635	444	79½	27½	20,433 *t.* B.	Bordeaux	1907	1908	1,661,409	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 10 *7·6-in.*, 13 *1·8-in.*, 10 *3-pr.*	2 (sub.)	19·26 *t*	905 1825	822
a.c.	**Victor Hugo** *Pl. 38.*	12,351	480½	70¼	27	28,486 *t.* B.	Lorient	1904	1907	1,229,932	6¾–4 H S.	2	5–3 H.S.	6	8 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 22 *1·8-in.*, 2 *1·4-in.*	2 (sub.)	22·5 *t*	1320 2100	728
b.	**Voltaire** *Pl. 36.*	18,754	481	84	27	22,500 B. tur.	La Seyne	1909	1911	2,169,200	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾ K.S.	4 *12-in.*, 12 *9·4-in.*, 16 *12-pr.*, 8 *3-pr.*, 2 *1-pr.*	2 (sub.)	20·66 *t*	960 2010	690
a.c.	**Waldeck-Rousseau**	14,220	515	70¼	27½	35,286 Nic. *t.*	Lorient	1908	1911	1,301,380	6½–3½	2½	5	4¾	6	5½	14 *7·6-in.*, 20 *2·4-in.*, 3 *3-pr.*, 2 *1-pr.*	2 (sub.)	23·10 *t*	1242 2300	738

* Work on these ships was suspended.

The battleships Tourville, Lille, Lyon, Duquesne, which were to be built under the Fleet Law (intended date of commencement, October, 1914), proposed armament, 16 13·4-in. guns in four turrets, have not yet been laid down.

Requin, 7214 tons, 2 10·8-in. and smaller guns, gunnery school ship; Pothuau, 5374 tons, training ship; Latouche-Tréville, 4681 tons, tender to gunnery ship. The old battleships Jauréguiberry, 11,637 tons, Brennus, 11,190 tons, Carnot, 11,954 tons, Charlemagne, 11,108 tons, and Charles Martel, 11,693 tons; and the armoured cruisers Bruix, 4735 tons, Dupetit-Thouars, 9367 tons, Kléber, 7578 tons, have been removed from the lists as no longer effective.

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FRANCE.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l. cr.	**Cassard**	3890	325½	45	20½	10,143 D'A.	Cherbourg	1896	1898	318,712	3	2 shield	6 *6·4-in.*, 4 *3·9-in.*, 10 *3-pr.*	2	19·8 *t*	630	385
,,	**D'Entrecasteaux** shd.	8123	394	58½	25¾	14,500	La Seyne	1896	1898	667,740	4	10–3 H.S.	2 *9·4-in.*, 12 *5·5-in.*, 12 *3-pr.*	2 (sub.)	19·2 *t*	650	521
,,	**Descartes** shd.	3970	316	42¼	21¾	8500 B.	St. Nazaire	1894	1896	334,725	1½	..	4 *6·4-in.*, 10 *3·9-in.*, 8 *3-pr.*	2	19·5 *t*	552	386
,,	**D'Estrées** shd.	2460	311¾	39¼	17¾	8500 Nor.	Rochefort	1897	1900	208,200	1½	..	2 *5·5-in.*, 5 *3·9-in*, 8 *3-pr.*	..	20·5 *t*	345 / 480	234
,,	**Du Chayla** shd.	3957	325½	45	22	10,009 D'A.	Cherbourg	1895	1897	315,835	3	2 shield	6 *6·4-in.*, 4 *3·9-in.*, 8 *3-pr.*	2	20·2 *t*	624	385
,,	**Guichen** shd.	8282	436¼	54¾	24½	25,500 D'A.	St. Nazaire	1897	1899	611,945	2½	2 shield	2 *6·4-in.*, 6 *5·5-in.*, 12 *3-pr.*	..	23·5	1460 / 2000	625
,,	**Jurien de la Gravière** shd.	5690	449	43½	23	18,400 Guyot	Lorient	1899	1901	475,979	3	..	8 *6·4-in.*, 10 *3-pr.*	2 (sub.	22·9 *t*	5600 / 11,000	511
,,	**Lavoisier**	2320	330¼	34½	17¾	6800 B.	Rochefort	1897	1899	202,024	1½	2 shield	4 *5·5-in.*, 2 *3·9-in.*, 10 *3-pr.*	2	21·5	226	248

During the war thirty-five 15 and 17 knot gun-boats of 351 tons were built, as well as nine sloops and other vessels.

Two cruiser-scouts, 6000 tons, and three additional of a new class of *convoyeurs d'escadrilles*, 4500 tons, were to be built. In addition are the cruisers Cosmao and Surcouf, 1950 tons (1888-1895); and Friant, 3882 tons (1895); also the gun-vessels Décidée, 635 tons (1899), Dunois, 889 tons (1897), Kersaint, 1,223 tons (1897), and La Hire, 889 tons (1898), as well as several other gun-vessels and river gunboats.

Mine-layers Pluton and Cerbère, 560 tons, 6000 I.H.P., 20 knots; another laid down, 1914. Converted mining vessels, Cassini, 966 tons; Flamberge, 300 tons. Gunboat Balny 214 tons. Nine converted mine-sweepers. Foudre, 5984 tons, and Campines, depôt ships for balloons and seaplanes.

MERCHANT AUXILIARY CRUISERS.—La France, 22,500 register tons, 235 knots, Touraine, 8429 register tons, 19·5 knots, Lorraine, 11,869 register tons, 21 knots, Savoie, 11,200 register tons, 22½ knots, of the Compagnie Générale Transatlantique, and some other vessels; also the Amazone, Magellan, Tonkin, and other 17 and 17½ knot boats of the Messageries Maritimes, and the Burdigala, 18 knots, and Lutetia, 20·5 knots, of the Sud Atlantique line.

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THE SURRENDERED FLEET OF GERMANY.—Armoured Ships.

In the following lists the letter **S** implies that the ships so marked were sent for internment at Scapa Flow; **D** that they have been dismantled in German Ports; **O** that they are accounted obsolete.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal. Oil.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b. S	**Baden** . . *Pl. 40.*	28,000	623¼ *	99¾	28	56,000 T.	Danzig (Schichau)	1915	1917	..	15?	..	.. K.S.	..	..	..	8 *15-in.*, 16 *5·9-in.*, 4 *3·4-in.* A.A.	5 (sub.)	22·0	4724	1200
b. S	**Bayern** . . *Pl. 40.*	28,000	623¼ *	99¾	28	56,000 T.	Kiel (Howaldt)	1915	1916	..	15?	..	.. K.S.	..	..	..	8 *15-in.*, 16 *5·9-in.*, 4 *3·4-in.* A.A.	5 (sub.)	22·0	4724	1200
b. O	**Braunschweig**	12,997	398½ †	72¾	25¼	16,000 T.S. & C.	Germania	1902	1904	1,157,500	8¾–4 K.S.	3	5½ K.S.	5½ K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·0	1574 200	743
b. cr. S	**Derfflinger** § . *Pl. 46.*	26,180	689*	95¼	27¼	63,000 (P. tur.)	Hamburg (Blohm & Voss)	1913	1914	2,233,360	12–5 K.S.	3	..	9	10 K.S.	7	8 *12-in.*, 14 *5·9-in.*, 8 *3·4-in.*, 2 M.	4	27·0	4635 984	1125
b. O	**Deutschland** . *Pl. 41.*	13,040	398½ †	72¾	25¼	16,939 T.S. & C.	Germania	1904	1906	1,214,000	9–4 K.S.	3	8 K.S.	8–6¾ K.S.	10 6 K.S.	6¾ K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·5 *t*	1770 200	736
b. O	**Elsass** . .	12,997	398½ †	72¾	25¼	16,812 W.T.& C.	Danzig (Schichau)	1903	1904	1,157,500	8¾–4 K.S.	3	5½ K.S.	5½ K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·7	1574 200	743
b. S	**Friedrich der Grosse** *Pl. 42.*	24,310	564½ *	95¼	27¼	42,113 (A.E.G. tur.) *t.*	Hamburg (Vulcan)	1911	1913	2,326,600	13¾–7¾ K.S.	4	9 K.S	7¾	11¾ K.S.	7¾ K.S.	10 *12-in.*, 14 *5·9-in.*, 2 *3·4-in*, 4 L.	5	21·0	3543 200	1125
b cr. .	**Graf von Spee** *Pl. 45.*	27,000	715*	93	27	..	Danzig (Schichau)	1917	..	..	7 K.S.	..	..	..	10 K.S.	..	6 *15-in.*, 14 *5·9-in.*, 8 *3·4-in.* A.A.	6 (sub.)	28·0	1000 4800	..
b. S	**Grosser Kurfürst** *Pl. 41.*	25,390	573¼ *	96¾	27¼	31,000 T.S.	Hamburg (Vulcan)	1913	1914	2,500,000	14–6 K.S.	3	10 K.S.	10 K.S.	14 K.S.	8 K.S.	10 *12-in*, 14 *5·9-in.*, 4 *3·4-in.*	5 (sub.)	21·0	3543 690	1150
b. O	**Hannover** . *Pl. 44.*	13,040	398½ †	72¾	25¼	22,492 T.S. *t.*	Wilhelms-haven	1905	1907	1,157,500	9½–4 K.S.	3	8 K.S.	8–6¾ K.S.	10–6 K.S.	6¾ K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	19·16 *t*	1770 200	736
b. .	**Helgoland** *Pl. 43.*	22,440	546½ *	93½	27	31,258 *t.*	Kiel (Howaldt)	1909	1911	2,304,300	11¾–7¾ K.S.	3	7¾	7¾	11¾ K.S.	7¾ K.S.	12 *12-in.*, 14 *5·9-in.*, 2 or 4 *3·4-in.*, 2 M.	6 (sub.)	20·8 *t*	2950 200	1107
b. O	**Hessen** .	12,997	398½ †	72¾	25¼	16,000 T.S. & C.	Kiel (Germania)	1903	1905	1,157,500	8¾–4 K.S.	3	5½ K.S.	5½ K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·0	1574 200	743

* Length on water-line. † Length between perpendiculars. ‡ Exclusive of armament. § Lützow sister ship sunk in Jutland battle.

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THE SURRENDERED FLEET OF GERMANY.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal. / Oil.	Complement.
		tons	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
b. cr. S	Hindenburg . *Pl. 46.*	26,200	689*	95¼	27½	85,000 (P. tur.)	Wilhelmshaven	1915	1917	..	12? K.S.	3	9 K.S.	9	10 K.S.	7	8 *12-in.*, 16 *5·9-in.*, 8 *3·4-in.* A.A.	5 (sub.)	28·0	..	..
b. S	Kaiser . *Pl. 42.*	24,310	564½ *	95¼	27¼	55,100 *t* (P. tur.)	Kiel .	1911	1912	2,366,000	13¾–7¾ K.S.	4	9 K.S.	7¾	11¾ K.S.	7¾ K.S.	10 *12-in.*, 14 *5·9-in.*, 2 *3·4-in.*, 4 L.	5 (sub.)	23·46 *t*	3543 200	1125
b. S	Kaiserin . *Pl. 42.*	24,310	564½ *	95¼	27¼	42,500 *t* (tur.)	Kiel . (Howaldt)	1911	1913	2,366,000	13¾–7¾ K.S.	4	9 K.S.	7¾	11¾ K.S.	7¾ K.S.	10 *12-in.*, 14 *5·9-in.*, 2 *3·4-in.*, 4 L.	5 (sub.)	22·3 *t*	3543 200	1125
b. S	König . *Pl. 41.*	25,390	573½ *	96¾	27¼	31,000 T.S.	Wilhelmshaven	1913	1914	2,500,000	14–6 K.S.	3	10 K.S.	10 K.S.	14 K.S.	8 K.S.	10 *12-in.*, 14 *5·9-in.*, 4 *3·4-in.*, 2 M.	5 (sub.)	21·0	3543 690	1150
b. S	König Albert . *Pl. 42.*	24,310	564½ *	95¼	27¼	39,813 *t* Schichau T.	Danzig (Schichau)	1912	1913	2,355,400	13¾–7¾ K.S.	4	9 K.S.	7¾	11¾ K.S.	7¾ K.S.	10 *12-in.*, 14 *5·9-in.*, 2 *3·4-in.*	5 (sub.)	22·15 *t*	3543 200	1125
b. S	Kronprinz Wilhelm *Pl. 41.*	25,390	573½ *	96¾	27¼	31,000	Kiel (Germania)	1914	1915	2,500,000	14–6 K.S.	3	10 K.S.	10 K.S.	14 K.S.	8 K.S.	10 *12-in.*, 14 *5·9-in.*, 4 *3·4-in.*, 2 M.	5 (sub.)	22·0	3543 690	1150
b. O	Lothringen .	12,997	398½ †	72¾	25¼	16,950 W.T.&C.	Schichau (Danzig)	1904	1906	1,157,500	8¾–4 K.S.	3	5½ K.S.	5½ K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·54 *t*	1574 200	743
b. cr. .	Mackensen . *Pl. 46.*	26,200	689*	95¼	27½	85,000	Hamburg .	1917	1919	..	12 K.S.	3	9	9	10 K.S.	7	8 *12-in.*, 16 *5·9-in.*, 8 *3·4-in.* A.A.	5 (sub.)	28·0	..	..
b. S	Markgraf . *Pl. 41.*	25,390	573½ *	96¾	27¼	31,000 T.S.	Bremen (Weser)	1913	1915	2,500,000	14–6 K.S.	3	10 K.S.	10 K.S.	14 K.S.	8 K.S.	10 *12-in.*, 14 *5·9-in.*, 4 *3·4-in.*, 2 M.	5 (sub.)	22·0	3543 690	1150
b. cr. S	Moltke . *Pl. 48.*	22,640	610¼ *	96¾	27	85,782 *t* (P. tur.)	Hamburg . (Blohm & Voss)	1910	1912	2,156,500	11–4 K.S.	2	..	8	10 K.S.	5 K.S.	10 *11-in.*, 12 *5·9-in.*, 2 *3·4-in.*, 2 M.	4 (sub.)	28·4 *t*	3050 200	1013
b. D	Nassau . *Pl. 44.*	18,600	452†	88¼	26½	25,850 *t*	Wilhelmshaven	1908	1909	1,825,000	11½–4 K.S.	2½	7¾	7¾	11 K.S.	6½	12 *11-in.*, 12 *5·9-in.*, 2 or 4 *3·4-in.*, 4 l.	6 (sub.)	20·7 *t*	2660 200	961
b. .	Oldenburg . *Pl. 43.*	22,440	546¼ *	93½	27	31,394 *t*	Danzig (Schichau)	1910	1912	2,304,300	11¾–7¾ K.S.	3	7¾	7¾	11¾ K.S.	7¾ K.S.	12 *12-in.*, 14 *5·9-in.*, 2 or 4 *3·4-in.*, 2 M.	6 (sub.)	21·3 *t*	2950 200	1107
b. .	Ostfriesland . *Pl. 43.*	22,440	546¼ *	93½	27	35,500 *t*	Wilhelmshaven	1909	1911	2,304,300	11¾–7¾ K.S.	3	7¾	7¾	11¾ K.S.	7¾ K.S.	12 *12-in.*, 14 *5 9-in.*, 2 or 4 *3·4-in.*, 2 M.	6 (sub.)	21·23 *t*	2950 200	1107
b. D	Posen . *Pl. 44.*	18,600	452†	88¼	26½	25,000	Kiel (Germania)	1908	1910	1,825,000	11¾–4 K.S.	2½	7¾	7¾	11 K.S.	6½	12 *11-in.*, 12 *5·9 in.*, 16 *3·4-in.*, 4 l.	6 (sub.)	20·5	2660 200	961
b. O	Preussen .	12,997	398½ †	72¾	25¼	18,374 W.T.& C.	Stettin .	1903	1905	1,157,500	8¾–4 K.S.	3	5½ K.S.	5½ K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 2 *3·4-in.*, 2 M.	6 (sub.)	18·6 *t*	1574 200	743

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b.	S	**Prinz-Regent Luitpold**	*Pl.* 42.	24,410	564½ *	95½	27½	40,000 (P. tur.)	Kiel (Germania)	1912	1913	2,355,400	13¾ K.S.	7¾	4	9 K.S.	7¾	11¾ K.S.	7¾ K.S.	10 *12-in.*, 14 *5·9-in.*, *3·4-in.*, 4 l.	2	5 (sub.)	21·0	3543 200	1125
b.	D	**Rheinland**	*Pl.* 44.	18,600	452 †	88½	26½	25,000	Stettin (Vulcan)	1908	1910	1,825,000	11¾–4 K.S.	2½		7¾	7¾	11 K.S.	6½	12 *11-in.*, 12 *5·9-in.*, *3·4-in.*, 4 l.	16	6 (sub.)	20·0	2660 200	961
a. c.	D	**Roon**		9350	403½ †	66¼	24	20,625 Dürr. *t.*	Kiel.	1903	1906	875,000	4–3 K.S.	2¾		4 K.S.	4 K.S.	6 K.S.	4 K.S.	4 *8·2-in.*, 10 *5·9-in.*, *3·4-in.*, 2 M.	14	4 (sub.)	21·17 *t*	1545 200	638
b.		**Sachsen**	*Pl.* 40.	28,000	623½ *	99¾	28	56,000 T.	Kiel (Germania)	1916	..	..	15? K.S.	..		..	..	..	..	8 *15-in.*, 16 *5·9-in.*, *3·4-in.*, A.A.	4	5 (sub.)	22·0	4724	1200
b.	O	**Schlesien**		13,040	398½ †	72¾	25¼	16,939 T.S. & C.	Schichau	1906	1908	1,214,000	9½–4 K.S.	3		8 K.S.	8–6¾ K.S.	11–6 K.S.	6¾ K.S.	4 *11-in.*, 14 *6·7-in.*, *3·4-in.*, 2 M.	2	6 (sub.)	19·2 19·5 *t*	1720 260	736
b.	O	**Schleswig-Holstein**	*Pl.* 44.						Germania																		
b. cr.	S	**Seydlitz**	*Pl.* 47.	24,610	656¼ *	93½	27	89,738 *t.* (P.T.)	Hamburg (Blohm & Voss)	1912	1913	2,186,150	11¾–4 K.S.	2		7 K.S.	8¾ K.S.	18 K.S.	6 K.S.	10 *11-in.*, 12 *5·9-in.*, *3·4-in.*, 4 M.	2	4 (sub.)	29·2 *t*	3543 200	1108
b.		**Thüringen**	*Pl.* 43.	22,440	546¼ *	93½	27	34,944 *t.* (tur.)	Bremen (Weser)	1909	1911	2,304,300	11¾–7¾ K.S.	3		7¾	7¾	11¾ K.S.	7¾ K.S.	12 *12-in.*, 14 *5·9-in.*, 4 *3·4-in.*, 2 M.	2 or	6 (sub.)	21·07 *t*	2950 200	1107
b. cr.	S	**Von der Tann**	*Pl.* 49.	19,100	562¾ *	87¼	26½	79,800 *t.* (P.tur.)	Hamburg (Blohm & Voss)	1909	1911	1,793,500	9¾–4 K.S.	3		..	7	9	5 K.S.	8 *11-in.*, 10 *5·9-in.*, *3·4-in.*, 2 M.	4	4	27·75 *t*	2960 200	910
b.	D	**Westfalen**	*Pl.* 44.	18,600	452 †	88½	26½	26,792 (*t.*)	Bremen (Weser)	1908	1909	1,825,000	11½–4	2½		7¾	7¾	11	6½	12 *11-in.*, 12 *5·9-in.*, *3·4-in.*, 4 l.	16	6 (sub.)	20·2 *t*	2660 200	961
b.		**Württemberg**	*Pl.* 40.	28,000	623¼ *	99¾	28	56,000 T.	Hamburg (Vulcan)	1917	..	..	15? K.S.	..		..	..	..	..	8 *15-in.*, 16 *5·9-in.*, *3·4-in.*, A.A.	4	5 (sub.)	22·0	4724 —	1200

* Length on water-line. † Length between perpendiculars.

The battleship Ersatz Kaiser Wilhelm der Grosse (Howaldt yard, Kiel) and the battle-cruisers Prinz Eitel Friedrich (Wilhelmshaven), of Graf von Spee class, and Ersatz Hansa (Blohm & Voss, Hamburg), were laid down but not completed. There was also the ex-Salamis, built for Greece, and taken over.

Under the Peace terms all German surface warships interned in Allied ports—*i.e.* those indicated above with the letter **S**—are to be finally surrendered. Certain other ships in the above list are also to be surrendered.

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THE SURRENDERED FLEET OF GERMANY.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armament. Guns	Armament. Torpedo Tubes.	Speed.	Coal. / Oil.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l. cr.	**Amazone** . . shd.	2618	328	38½	16	8000 T.S.	Kiel (Germania) .	1900	1901	247,000	..	2	10 *4·1-in.*, 14 M. . .	2 (sub.)	21·5 *t*	560	275
,,	**Arcona** . . shd.	2657	328	38½	16	8000 T.S.	Bremen (Weser) .	1902	1903	254,500	..	2	10 *4·1-in.*, 14 M. . .	2 (sub.)	21·0	700	281
,,	**Augsburg** . . .	4280	402 ‡	46	16½	31,340 *t* (tur.)	Kiel . . .	1909	1910	417,810	..	2	6 *5·9-in.*, 2 *3·4 in.* A.A., 2 M. (re-armed).	2 (sub.)	27·01 *t*	890	379
,,	**Berlin.** . . shd.	3200	340½ ‡	43¼	16½	11,000 T.S.	Danzig . .	1903	1905	254,500	..	2	10 *4·1-in.*, 2 M. . .	2 (sub.)	23·2 *t*	846	303
mining *crs.*	S **Bremse** . . .	4000	430 †	44	15½	46,000 T.	Stettin (Vulcan) .	1915	1916	..	..	..	4 *5·9-in.*, 2 *3-4in.* A.A. (carried about 360 mines)	2 or 4 (sub.)	34	..	480
	S **Brummer** . . .																
l. cr.	**Danzig** . . .	3200	340½ ‡	43¼	16½	10,000 T.S.	Danzig . . .	1905	1907	254,500	..	2	10 *4·1-in.*, 2 M. . .	2 (sub.)	23·0	846	303
,, S	*Dresden (*ex*-Amazone).	4200	450 †	45	16	45,000	Kiel (Howaldt) .	1916	1918	..	4–2½	..	7 *5·9-in.*, 3 *3·4-in.* A.A. .	4	28·5	..	500
g.b.	**Eber**	977	206¾	30¼	10¾	1300 T.S.	Danzig . . .	1903	1904	91,000	..	..	8 *3·4-in.*, 6 *1·4-in.*, 2 M.	..	13·0	240	130
l. cr. S	*Emden (*ex*-Nymphe) .	4200	450 †	45	16	45,000	Bremen (Weser) .	1916	1917	..	4–2½	..	7 *5·9-in.*, 3 *3·4-in.* A.A., 2 M.	4	28·5	..	500
,, S	**Frankfurt** . . .	5120	465 †	51¼	17	45,000	Kiel . . .	1915	1915	..	4–2½	2	8 *5·9-in.*, 2 *3·4-in.* A.A..	2 (sub.)	28·0	..	500
,,	**Graudenz** . . .	4842	456 †	45	17	26,000 P.T.	Kiel . . .	1913	1914	417,810	4–2½	2	7 *5·9-in.*, 2 *3·4-in.*, 2 M. (re-armed).	2 (sub.)	27·5	1279 220	373
,,	*Pl. 50.* **Hamburg** . . shd.	3200	340½ ‡	43¼	16½	11,848 *t* T.S.	Stettin (Vulcan) .	1903	1904	254,500	..	2	10 *4·1-in.*, 2 M. . .	2 (sub.)	23·1 *t*	846	303
,, S	*Karlsruhe (*ex*-Niobe) .	4200	450 †	45	16	45,000	Kiel . . .	1916	1917	..	4–2½	1	7 *5·9-in.*, 3 *3·4-in.* A.A., 2 M.	4	28·5	..	500
,,	**Kolberg** . . .	4280	402 ‡	46	16½	30,400 *t* (tur.)	Danzig (Schichau).	1908	1910	380,870	..	2	6 *5·9-in.*, 4 *3·4-in.* (re-armed 1916).	2 (sub.)	26·3 *t*	890	379
,, S	*Köln (*ex*-Ariadne) .	4200	450 †	45	16	45,000	Hamburg (Blohm & Voss)	1916	1918	..	4–2½	..	7 *5·9-in.*, 3 *3·4-in.* A.A., 2 M.	4	28·5	..	500

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l. cr.	S	Königsberg .	4200	450 †	45	16	45,000	Bremen (Weser) .	1915	1916	..	4-2½	1	7 5·9-*in.*, 3 3·4-*in.* A.A., 2 M.	4 (sub.)	28·5	1400	500
,,		*Bremen (*ex*-R.) .						,, ,, .	..	..								
,,		*Weisbaden . (*ex*-Medusa)						,, ,, .	1917	..								
,,		*Leipsig (*ex*-P.) .						,, ,, .	1917	..								
,,		*Magdeburg (*ex*-Q.)						Hamburg (B. & V.)	..	..								
,,		Lübeck . . .	3200	341	43¼	16½	14,158 *t* T.S. tur.	Stettin (Vulcan) .	1904	1905	254,500	..	2	10 4·1-*in.*, 2 M. . .	2 (sub.)	23·1 *t*	846	303
,,		München . . shd.	3200	340½‡	43¼	16½	12,388 *t* T.S.	Bremen (Weser) .	1904	1905	254,500	..	2	10 4·1-*in.*, 2 M. . .	2 (sub.)	23·45 *t*	846	303
,,	S	*Nürnberg (*ex*-Thetis) .	4200	450†	45	16	45,000	Kiel (Howaldt) .	1916	1917	..	4-2½	1	7 5·9-*in.*, 3 3·4-*in.* A.A., 2 M.	4	28·5	..	500
g. b.		Panther . . .	962	206¾	30¼	10¾	1300 T.S.	Danzig . . .	1901	1902	91,000	..	..	8 3·4-*in.*, 6 1·4-*in.*, 2 M.	..	13·5 *t*	240	130
l. cr.		Pillau (*ex*-Muravev Amurski)	4320	441†	46	19½	27,400 T.	Danzig (Schichau) .	1914	1914	..	..	1	8 5·9-*in.*, 2 3·4-*in.* A.A. (Rearmed)	5	27·5	1000	..
,,		Regensburg . . *Pl. 50.*	4842	456†	45	17	26,000 P.T.	Bremen (Weser) .	1914	1915	417,810	4-2½	2	7 5·9-*in.*, 2 3·4-*in.* A.A., 2 M. (Rearmed)	2 (sub.)	27·5	1279 220	373
,,		Stettin . . .	3494	363¾‡	43⅜	15¾	21,600 *t* T.S. tur.	Stettin (Vulcan) .	1907	1908	312,120	..	2	10 4·1-*in.*, 2 M. . .	2 (sub.)	25·17 *t*	866	322
,,		Strassburg . . .	4480	446¼†	43½	15¾	33,742 *t* P. tur.	Wilhelmshaven .	1912	1912	416,340	4-2½	2	7 5·9-*in.*, 2 3·4-*in.* A.A., 2 M. (Rearmed)	2 (sub.)	28·28 *t*	1200	373
,,		Stralsund . . .	4480	446¼†	43½	15¾	35,515 *t* Berg. tur.	Bremen (Weser) .	1912	1913	416,340	4-2½	2	7 5·9-*in.*, 2 3·4-*in.* A.A., 2 M. (Rearmed)	2 (sub.)	28·27 *t*	1200 —	373
S.C.		Stuttgart . . .	3400	361‡	43¾	15¾	13,745 *t*	Danzig . . .	1906	1908	312,100	..	2	10 4·1-*in.*, 2 M. .	2 (sub.)	23·7 *t*	866	325

* New vessels of the same names as those sunk in the war. † Length on water-line. ‡ Length between perpendiculars.

The older cruisers, which had been converted into training and depot ships, have been removed from the list. A new Imperial yacht was in hand. The light cruiser Stuttgart, converted into a seaplane carrier, and part of her armament removed. Gunboat C, completed at Danzig, 1150 tons, 14 knots, 4 4·2-in., 2 M. Submarine salvage vessel Vulkan; another begun in 1912.

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GREECE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Giorgios Averoff** *Pl. 51.*	9956	429¾	68¾	24¾	20,000 B	Leghorn (Orlando)	1910	1911	1,100,000	8–3½ K.S.	1¾	7	7	7–6	..	4 *9·2-in.*, 8 *7·5-in.*, 16 *3-in.*, 8 *1·8-in.*	3 (sub.)	24·0	700 1600	..
b.	**Hydra** . . .	4808	334½	51¾	23¼	7000	St. Nazaire La Seyne .	1889	1891 1900	..	11¾–4	2½	3	..	13½	..	3 *10·6-in.* Canet, 5 *5·9-in.*, 1 *3·9-in.*, 8 *2·5-in.*, 4 *1·8-in.*, 12 *1·4-in.*	3	17·0	600	400
b.	**Kilkis** (*ex* Mississippi)	13,000	375	77	24¾	13,607 B.&W.	Philadelphia	1905	1908	616,360	9–4 K.S.	3½–1 K.S.	7 K.S.	7 K.S.	10–7½ K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *7-in.*, 12 *3-in.*, 6 *3-pr.*, 10 smaller	2 (sub.)	17·1 *t.*	600 1750	725
b.	**Lemnos** (*ex* Idaho) *Pl. 51.*																				
b.	**Psara** . . .	4808	334½	51¾	23¼	7000	Havre . . La Seyne .	1890	1892 1897	..	11¾–4	2½	3	..	13½	..	3 *10·6-in.* Canet, 5 *5·9-in.*, 1 *3·9-in.*, 8 *2·5-in.*, 4 *1·8-in.*, 12 *1·4-in.*	3	17·0	600	400
b.	**Spetsai** . .	4808	334½	51¾	23¼	7000	Havre . . La Seyne .	1889	1891 1900	..	11¾–4	2½	3	..	13½	..	3 *10·6-in.* Canet, 5 *5·9-in.*, 1 *3·9-in.*, 8 *2·5-in.*, 4 *1·8-in.*, 12 *1·4-in.*	3	17·0	600	400

GREECE.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	**Helli** (*ex* Fei-Hung)	2600	330	42	13	6500 tur.	Camden, N.J. .	1912	1914	240,000	¾	..	2 *6-in.*, 4 *4-in.*, 2 *12-pr.*, 6 *3-pr.*	2	22·5	..	..

Torpedo depôt-ship.—Kanaris, 1100 tons, 500 I.H.P., 2 3·9-in. (Krupp) guns, 14 knots speed. Mine-layers Aigialla, Monemvassia, Nauplia. Five old gunboats and four corvettes. The light cruisers Admiral Condouriotis and Lambros Katsonis (5500 tons, 25·5 knots) were taken over for the British Navy at the beginning of the war.

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ITALY.—Armoured Ships.

Class	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	ins.	ins.	ins.	ins.	ins.			knots.	tons.	
b.	**Ammiraglio di St. Bon**	9645	344½	69¼	24¾	13,500	Venice . .	1897	1901	..	9¾–4 H.S.	3–1½	6 H.S.	6 H.S.	9¾ H.S.	6 H.S.	4 *10-in.*, 8 *6-in.*, 8 *4·7-in.*, 2 *2·9-in.*, 8 *2·2-in.*, 12 *1·4-in.*, 2 M.	4	18·3 *t*	600	548
b.	**Andrea Doria** .	22,562	575¾	92	29	32,000 P. tur.	Spezia . .	1913	1915	..	10½–6 K.S.	1¾	6 K.S.	..	9½ K.S.	5 K.S.	13 *12-in.*, 16 *6-in.*, 13 *14-pr.*, 6 *14-pr.* A.A., 6 l.	3 (sub.)	23	1000	1074
b.	**Caio Duilio** . *Pl. 52.*					Y.	Castellammare	1913	1915											2500	
b.	**Caracciolo*** .	30,900	670	98	..	100,000 T.	Castellammare	Bldg.		..	13–7 K.S.	2	8 K.S.	..	10 K.S.	6 K.S.	8 *15-in.*, 16 *6-in.*, 20 *4-in.*, 4 M.	..	25·0	Oil	1300
b.	**Cristoforo Colombo***						Genoa (Ansaldo)	Bldg.													
b.	**Conte di Cavour** . *Pl. 53.*	22,023	559¾	92	29	24,000 Parsons B. & W.	Spezia . .	1911	1915	..	9½–4½ K.S.	1¾	6 K.S.	..	9½ K.S.	5 K.S.	13 *12-in.*, 18 *4·7-in.*, 14 *12-pr.*, 6 l. & M.	3 (sub.)	22 0	1000	999
b.	**Dante Alighieri** . *Pl. 53.*	19,400	505	85	27¼	35,000*t* Parsons Bl.	Castellammare	1910	1912	..	9½–4½ K.S.	1½	6 K.S.	..	10 K.S.	..	12 *12-in.*, 20 *4·7-in.*, 13 *12-pr.*	3 (2 sub.)	23·8 *t*	1000 2500	900
b.	**Emanuele Filiberto** .	9645	344½	69¼	24¾	13,500	Castellammare	1897	1901	..	9¾–4 H.S.	3–1	6 H.S.	6 H.S.	9¾ H.S.	6 H.S.	4 *10-in.*, 8 *6-in.*, 8 *4·7-in.*, 2 *2·9-in.*, 8 *2·2-in.*, 12 *1·4-in.*, 2 M.	4	18·3 *t*	600	536
a.c.	**Francesco Ferruccio** . *Pl. 55.*	7294	344	59¾	23¼	13,500 Nic.	Venice . .	1902	1904	..	6–3 H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	1 *10-in.*, 2 *8-in.*, 14 *6-in.*, 10 *2·9-in.*, 6 *1·8-in.*, 2 M.	4 (sub.)	20·0	655 1200	540
b.	**Francesco Morosini***	28,000	670	98	..	48,000	Leghorn (Orlando)	1915	..	..	13–7 K.S.	2	8 K.S.	..	10 K.S.	6 K.S.	8 *15-in.*, 16 *6-in.*, 20 *4-in.*, 4 M.	..	25·0	Oil	1300
b.	**Giulio Cesare** .	22,023	557	92	28	34,000 P. B.&W.	Genoa (Ansaldo)	1911	1914	..	9½–4½ K.S.	1¾	6 K.S.	..	9½ K.S.	5 K.S.	13 *12-in.*, 18 *4·7-in.*, 14 *12-pr.*, 6 l. & M.	3 (sub.)	23·0 *t*	1060	999
b.	**Leonardo da Vinci†** *Pl. 53.*					P. Bl.	Genoa (Odero)	1911	1914												
b.	**Marcantonio Colonna***	28,000	670	98	..	48,000	Genoa (Odero)	Bldg.	..	..	13–7 K.S.	2	8 K.S.	..	10 K.S.	6 K.S.	8 *15-in.*, 16 *6-in.*, 20 *4-in.*, 4 M.	..	25·0	Oil	1300

* Work upon these battleships has been stopped. Cristoforo Colombo is being dismantled.

† Leonardo da Vinci, blown up at Taranto, has been refloated, and is to be repaired. The armoured cruiser Marco Polo, 4511 tons, completed in 1894, has been converted into a troopship and renamed Cortellazzo.

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ITALY.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
b.	Napoli . . / Regina Elena . *Pl. 54.*	12,425	435½	73½	27¼	20,000 B.&W. / 20,000 B.	Castellammare / Spezia . .	1905 / 1904	1909 / 1907	1,120,000	9¾–4 H.S.	2	8 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 / 2000	711
a.c.	Pisa . . . *Pl. 54.*	9956	429¾	68¾	24¾	18,000 B.	Leghorn (Orlando)	1907	1909	..	8–3½ K.S.	1¾	7 K.S.	7 K.S.	7–6 K.S.	..	4 *10-in.*, 8 *7·5-in.*, 16 *3-in.*, 2 M.	3 (sub.)	23·0	700 / 1600	687
b.	Roma . . *Pl. 54.*	12,425	435½	73½	27¼	20,000 B. & W.	Spezia . .	1907	1909	1,120,000	9¾–4 H.S.	2	8 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 / 2000	711
a.c.	San Giorgio . / San Marco . *Pl. 55.*	9832	429¾	68¾	24¾	18000 Bl. / 18000 tur.	Castellammare	1908	1910	..	8–3½ K.S.	1¾	7 K.S.	7 K.S.	7–6 K.S.	7 K.S.	4 *10-in.*, 8 *7·5-in.*, 16 *3-in.*, 8 *1·8-in.*	3 (sub.)	22·5	700 / 1600	643
b.	Sardegna . . .	13,640	411	76¾	28½	19,650 *t*	Spezia . .	1890	1895	1,057,440	4	3	4	2¾	14½ *comp.*	..	4 *67-ton* (A.), 8 *5·9-in.*, 16 *4·7-in.*, 2 *2·9-in.*, 20 *2·2-in.*, 10 *1·4-in.*, 2 M.	5	20·1 *t*	1200	785
a.c.	Varese . . *Pl. 55.*	7294	344	59¾	23⅓	13,500 B.	Leghorn (Orlando)	1899	1901	..	6–4½ H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	1 *10-in.*, 2 *8-in.*, 14 *6-in.*, 10 *2·9-in.*, 6 *1·8-in.*, 2 M.	4	20·0	650 / 1200	500
b.	Vittorio Emanuele III *Pl. 54.*	12,425	435½	73½	27¼	20,000 B.	Castellammare	1904	1907	1,120,000	9¾–4 H.S.	2	8 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 / 2000	711

Monitors Faa di Bruno, Carso, Cucco, Monfalcone and Vodice, 1,650 tons, 2 *15-in.*, 4 *14-pr.*, and 6 light guns.

The old battleship Sicilia has been converted into a repair ship. The armoured cruiser Zenson (*ex* Carlo Alberto) is now a troopship, and the Vettor Pisani has been disarmed.

The late Austro-Hungarian battleships Tegetthoff and Franz Ferdinand, with the light cruiser Saida, have been taken to Venice.

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ITALY.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armaments. Guns.	Armaments. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
Scout	Alessandro Poerio	1012	279	26¼	9¼	20,000 turb.	Genoa (Ansaldo)	1914	1915	..	..	..	6 *4-in.*, 4 *2-pr.* A.A.	2 dbl.	32·0	400	100
,,	Aquila	1500	310	31	..	..	Genoa (Ansaldo)	1915	1916	..	..	..	3 *6-in.*, 4 *12-pr.* A.A.	4	35·0	350 Oil	160
,,	Augusto Riboty																
l. cr.	Basilicata	2460	251	41¾	17	4000	Castellammare	1914	1915	..	1	..	6 *6-in.*, 2 *14-pr.*, 3 *14-pr.*, A.A., 2 M.	..	16·5	500	..
,,	Campania																
,,	Calabria	2452	249¼	42	16¾	4094 *t*	Spezia	1894	1897	183,120	2	..	6 *4·7-in.*, 10 smaller	2	16·4 *t*	500	257
Scout	Carlo Alberto Raccia	1500	310	31	..	..	Genoa (Ansaldo)	1915	1916	..	..	..	3 *6-in.*, 4 *12-pr.* A.A.	4	35·0	350 Oil	160
,,	Carlo Mirabello	1476	331	31·3	..	35,000	Genoa (Ansaldo)	1914	1916	..	..	..	8 *4-in*, 2 *12-pr.* A.A.	4	35·0	350 Oil	140
,,	Falco	1460	310	31	..	40,000	Naples (Pattison)	..	1918	..	..	..	3 *6-in.*, 4 *12-pr.* A.A.	2 dbl.	35·0	200	160
g.v.	Governolo	1235	185	33¾	13¾	1100	Venice	1894	1896	58,440	..	..	4 *4·7-in.*, 4 *2·2-in.*, 2 *1·4-in.*, 2 M.	..	13·0	200	131
Scout	Guglielmo Pepe	1012	279	26¼	9¼	20,000 turb.	Genoa (Ansaldo)	1914	1915	..	..	..	6 *4-in.*, 4 *2-pr.* A.A.	2 dbl.	32·0	400	100
to.g.b.	Iride	931	229½	27	10¼	4242	Castellammare	1891	1892	72,920	1	..	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	6	19·6 *t*	120	111
Scout	Leone	1985	359	33½	..	24,200	Genoa (Ansaldo)	Bldg.	..	..	..	..	6 *4 7-in.*, 4 *2-pr.* A.A	2 dbl.	34·0	400	..
,,	Leopardo																
,,	Lince																
l. cr.	Libia	3690	341½	47	..	12,500	Genoa (Ansaldo)	1912	1913	..	1½	..	2 *6-in*, 8 *4·7-in.*, 14 smaller	2	22·0	630	300

ITALY.—Cruising Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
l. cr.	**Liguria**	tons. 2245	ft. 262½	ft. 59¼	ft. 16¾	7677 *t*	Genoa (Ansaldo)	1893	1894	£ 183,120	in. 2	in. 4½	2 *5·9-in.*, 6 *4·7-in.*, 2 *3-in.*, 2 *2·2-in.*, 4 smaller	2	knots. 19·6	tons. 430	257
Scout	**Marsala**	3400	460½	42¾	13¼	22,500 P.tur.Bl.	Castellammare	1912	..	..	1½	..	6 *4·7-in.* and 6 *12-pr.*, mining equipment	2	*t* 28·0	800	240
to.g.b.	**Minerva**	833	246	27½	11¾	4800 W.T.	Genoa (Ansaldo)	1892	1893	72,720	1	..	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	5	21·0	120	111
Scout	**Nibbio**	1460	310	31	..	10,000	Naples (Pattison)	1916	1918	..	..	..	3 *6-in*, 4 *12-pr.* A.A.	4	35·0	323 Oil.	160
..	**Nino Bixio**	3400	460¼	42¾	13¼	22,500 Bl.Cur.t.	Castellammare	1911	1914	..	1½	..	6 *4·7-in.* and 6 *12-pr.*, mining equipment	2	27·7	800	300
..	**Pantera**	1012	279	26¼	9¼	20,000	Genoa (Ansaldo)	1914	1915	..	..	..	6 *4-in.*, 4 *2-pr.* A.A.	2 (dbl.)	32·0	400	100
l. cr.	**Puglia**	2498	269	41	16¾	7000	Taranto.	1898	1901	200,000	4½	1	4 *5·9-in.*, 6 *4·7-in.*, 1 *2·9-in.*, 8 *2·2-in.*, 8 *1·4-in.*, 2 M.	2	20·0	650	257
Scout	**Quarto**	3220	432	42¾	13¼	29,000 P.tur.Bl.	Venice	1911	1912	..	1½	..	6 *4·7-in.* and 6 *12-pr.*, mining equipment	2	28·6	450	240
g.v.	**Sebastiano Caboto**	800	250	31¾	9	2000	Palermo	1912	..	..	..	..	6 *12-pr.*, 4 M.	..	13·0	100	..
Scout	**Sparviero**	1500	310	31	..	..	Genoa (Ansaldo)	1915	1917	..	..	..	3 *6-in.*, 4 *12-pr.* A.A.	4	35·0	350 Oil	160
..	**Tigre**	1985	359	33½	..	24,200	Genoa (Ansaldo)	Bldg.	..	..	..	..	6 *4·7-in.*, 4 *2-pr.* A.A.	2 (dbl.)	34·0	400	..

Etna (3474 tons), converted into a training ship. Goito, Montebello, Tripoli, Agordat, Coatit, Etruria, and Puglia, mining vessels. Coal and liquid fuel transport Bronte (9490 tons). The Carlo Mirobello, Carlo Alberto Raccia and Augusto Riboty are fitted to carry 100 mines, and the Aquila, Sparviero, Nibbio and Falco 50 mines each. Anteo, submarine salvage vessel, Lagoon gunboats and mine-layers Brondolo and Marghera, 1900 tons, 17 knots. Surveying vessel, Ammiraglio Magnaghi, 1800 tons, 14 knots. Small vessels, Capitano Verri (*ex*-Thetis) and Bengazi (*ex*-Derna) captured from the Turks.

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JAPAN.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						in.	in.	in	in.	in.	in.			knots.	tons.	
a.c.	Adzuma . .	9436	431½	59½	24¾	17,000 B.	St. Nazaire .	1899	1901	..	7–3½ H. S.	3	5 H.S.	..	6 H. S.	6 H.S.	4 *8-in.*, 12 *6-in.*, 12 *3-in.*, 8 *1·8-in.*	5 (4 sub.)	20·0	600 1275	482
b.	Aki . . *Pl. 57.*	19,800	400	83½	27½	24,000 My. tur.	Kure . .	1907	1911	..	9–5 K. S.	2–3	8	..	9	6	4 *12-in.*, 12 *10-in.*, 8 *6-in.*, 8 *12-pr.*, 8 l. and M.	5 (sub.)	20·5	..	940
,,	Asahi . . .	14,765	400½	75¼	27½	16,000 B.	Clydebank .	1899	1900	..	9–4 H. S.	4–2½	6 H.S.	12 H.S.	14 H. S.	6 H.S.	4 *12-in.*, 14 *6-in.*, 20 *12-pr.*, 8 *3-pr.*, 4 *2½-pr.*	4 (sub.)	18	700 1549	750
a.c.	Asama . .	9885	408	67	24½	19,000 *t.*	Elswick .	1898	1899	..	7–3½ H. S.	2	5 H.S.	..	6	6 H.S.	4 *8-in.*, 14 *6-in.* (A.), 12 *12-pr.*, 8 *2½-pr.*	5 (4 sub.)	22·1 *t*	600 1409	482
,,	Aso (*ex* Bayan) .	7726	443	55¾	22	17,400 My. *t.*	La Seyne .	1900	1902	..	8–3 K.S.	2	3 K.S.	..	7 K.S.	3 K.S.	2 *8-in.*, 8 *6-in.*, 22 small, l., and M.	2 (sub.)	22 *t*	750 11,000	570
b.	Fuji . . .	12,649	374	73	26½	14,000	Thames .	1896	1897	..	18–6 H. S.	4–2½	4 H.S.	..	14 H. S.	6 H.S.	4 *12-in.*, 10 *6-in.*, 20 *3-pr.*, 4 *4½-pr.*	5 (4 sub.)	19·2 *t*	1100	600
b.	Fuso* . .	31,000	658	94	28½	45,000 tur.	Kure .	1914	1917	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 16 *6-in.*, 4 *12-pr.* 3 A.A.	6 (sub.)	22·5	..	..
b.	Hyuga* . *Pl. 56.*						Nagasaki (Mitsubishi)	1915	1918	..											
b.c.	Haruna .	27,500	704	92	27½	64,000 My. P. t. My. C. t.	Kobe . (Kawasaki)	1913	1916	..	10 K.S.	2¾	..	..	10 K.S.	..	8 *14-in.*, 16 *6-in.*, 18 smaller and M.	8 (sub.)	27	1000 3500	1100
,,	Hiyei . . *Pl. 59.*						Yokosuka .	1912	1915	..											
b.	Hizen (*ex* Retvizan)	12,700	374	72½	25	16,000 My.	Philadelphia	1900	1902	..	9–4 K.S.	4	6-2 K.S.	9 K.S.	10 K.S.	5 K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-pr.*, 6 *1-pr.*	2	18·0	800 2000	778
a.c.	Ibuki . . *Pl. 60.*	14,620	450½	75½	26¼	27,000 My. tur.	Kure . .	1907	1909	..	7–4 K.S.	2	5 K.S.	..	9 K.S.	..	4 *12-in.*, 8 *8-in.*, 14 *4·7-in.*, 3 *1·8-in.*, 2 l., 4 M.	3 (sub.)	22	2000	820
,,	Idzumo .	9750	400	68½	24½	17,300 B. *t.*	Elswick	1899	1900	..	7–3½ H.N.S.	2½	5 H.N.S.	..	6 H. N.S.	6 H. N.S	4 *8-in.*, 14 *6-in.*, 12 *12-pr.*, 8 *2½-pr.*	4 (sub.)	22·0 21·7 *t*	600 1412	672
,,	Iwate . .							1900	1901												

* Particulars uncertain.

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JAPAN.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Ikoma** . . *Pl. 60.*	13,750	440	75	26	22,670 My.	Kure .	1906	1908	..	7–5 K.S.	1½	..	..	7 K.S.	..	4 *12-in.*, 12 *6-in.*, 12 *4·7-in.*, 2 *1·8-in.*, 2 l., 4 M.	3 (sub.)	21·0	600 2000	817
b.	**Ise*** . . *Pl. 56.*	31,000	658	94	28½	45,000 P. tur.	Kobe . (Kawasaki)	1916	1918	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 16 *6-in.*, 4 *12-pr.*, 3 A.A.	6 (sub.)	22·5	..	..
b.	**Iwami** (*ex* Orel)	13,516	367½	76	26	16,000 My.	Petrograd (Galerny)	1902	1904	..	9–4 K.S.	2½–1½	6 K.S.	9 K.S.	10 K.S.	6 K.S.	4 *12-in.*, 6 *8-in.*, 24 *3-in.*, and smaller.	3 (2 sub.)	18·0	800 2000	740
b.	**Kaga** . .	32,000	..	..	..	..	Kobe (Kawasaki)	Pro.	..	..	..	..	..	..	..	..	8 *16-in.*	..	..	..	..
b.	**Kashima** . *Pl. 58.*	16,400	425	78⅛	27	17,280 Nic.	Elswick .	1905	1906	..	9–4 K.S.	3–2½	6	6	9 K.S	6 K.S.	4 *12-in.*, 4 *10-in.*, 12 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 6 M., 2 l.	5 (sub.)	19·2 *t*	750 2150	980
a.c.	**Kasuga** . .	7630	344	59¾	24¼	14,900	Sestri Ponente	1902	1904	760,000	6 H. N.S.	1½	6 H. N.S.	6 H. N.S.	6 H. N.S.	6 H. N.S.	1 *10-in.*, 2 *8-in.*, 14 *6-in.*, 10 *3-in.*, 6 *1·8 in.*, 2 M.	4	20·0	600 1150	500
b.	**Katori** . *Pl. 58.*	15,950	420	78	27	18,500 *t*, Nic.	Barrow .	1905	1906	..	9–5 K.S.	3–2	6	6	10 K.S.	6 K.S.	4 *12-in.*, 4 *10-in.*, 12 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 6 M., 2 l.	5 (sub.)	19·5 *t*	750 1800	980
b.c.	**Kirishima** . *Pl. 59.*	27,500	704	92	27½	64,000 My P t.	Nagasaki . (Mitsubishi)	1913	1916	..	10–4 K.S.	2¾	..	..	10 K.S.	..	8 *14-in.*, 16 *6-in.*, 18 smaller and M.	8 (sub.)	28·0	1000 3500	1100
,,	**Kongo** . *Pl. 59.*	27,500	704	92	27½	64,000 Y. P. t.	Barrow .	1913	1913	2,500,000	10–4 K.S.	2¾	..	..	10 K.S.	..	8 *14-in.*, 16 *6-in.*, 5 M., 16 smaller	8 (sub.)	25·0	1000 3500	1100
a.c.	**Kurama** . *Pl. 60.*	14,620	450½	75½	26¼	27,000 My.	Yokosuka .	1907	1911	..	7–4 K. S.	2	5 K.S.	..	9 K. S.	..	4 *12-in.*, 8 *8-in.*, 14 *4·7-in.*, 3 *1·8-in.*, 2 l., 4 M.	3 (sub.)	22·0	2000	820
b.	**Mikasa** .	15,362	400	76	27¼	16,431 B.	Barrow .	1900	1902	..	9–4 H.N.S.	3	6 H. N.S.	12 H.N.S.	14 H. N.S.	6 H. N.S.	4 *12-in.*, 4 *10-in.*, 10 *6-in.*, 20 small	4 (sub.)	18·5 *t*	700 1520	935

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c.d.	**Mishima** (*ex* Seniavine)	4792	265	52½	17	5000 My.	Petrograd	1894	1895	410,000	10	3	..	..	7–8	..	4 *10-in.*, 4 *4·7-in.*, 6 *1·8-in.*, 8 M.	4	16·0	400	318
b.	**Mutsu**† .	32,000	..	..	..	..	Yokosuka	1916	..	..	..	..	..	..	..	..	8 *16-in.*	..	..	..	..
b.	**Nagato** .						Kure .														
a.c.	**Nisshin** . .	7630	344	59¾	24¼	13,500	Sestri Ponente	1903	1904	760,000	6 H. N.S.	1½	6 H. N.S.	6 H. N.S.	6 H. N.S.	6 H. N.S.	4 *8-in.*, 14 *6-in.*, 10 *3-in.*, 6 *1·8-in.*, 2 M.	4	20·0	600 1150	500
c.d.	**Okinoshima** (*ex* Apraxine)	4126	277½	52½	17½	5757 *t.*	Petrograd (New Admiralty)	1896	1898	..	10 H. S.	3	..	..	7¾ K. S.	..	3 *10-in.*, 4 *4·7-in.*, 12 *1·8-in.*, and smaller	4	15·0 *t*	215	318
b.	**Satsuma** . . *Pl.* 58.	19,350	450	83½	27½	19,370 My.	Yokosuka .	1906	1910	..	9–5 K. S.	2–3	8	..	9	6	4 *12-in.*, 12 *10-in.*, 12 4 *·7-in.*, 4 *12-pr.*, 8 l. and M.	5 (sub.)	18·5	1000 2500	940
b.	**Settsu** . . *Pl.* 57.	20,800	500	84	28	26,500 tur.	Yokosuka .	1911	1912	..	12–9½ K.S.	2½	9 K.S.	..	12 K.S.	6 K.S.	12 *12-in.*, 10 *6-in.*, 8 *4·7-in.*, 16 small, l. and M.	5 (sub.)	20·5	900 2500	960
b.	**Shikishima** . .	14,850	400	75¼	26½	16,355 B.	Thames .	1898	1899	..	9–4 H.N.S.	4–2½	6 H. N.S.	12 H. N.S.	14	6 H. N.S.	4 *12-in.*, 14 *6-in.*, 20 *12-pr.*, 8 *3-pr.* 4 *2½-pr.*, 8 M.	5 (4 sub.)	18·3	700 1722	741
b.	**Suwo** (*ex* Pobieda) .	12,674	401¼	71½	26	14,500 My.	Petrograd (Baltic)	1900	1901	..	9½–4 H. S.	2¾	9 H. S.	9 H. S.	9 H. S.	6 H.S.	4 *10-in.*, 10 *6-in.*, 22 *12-pr.*, and smaller	2 (sub.)	18·0	800 2056	732
a.c.	**Tokiwa** . .	9850	408	67	24½	20,556 *t.*	Elswick .	1898	1899	..	7–3½ H. S.	2	5 H.S.	..	6 H. S.	6 H.S.	4 *8-in.*, 14 *6-in.* (A.), 12 *12-pr.*, 8 *2½-pr.*	5 (4 sub.)	20·0	600 1409	500
b.	**Tosa** . .	32,000	..	..	..	..	Kure .	Pro.	..	..	..	..	..	..	..	..	8 *16-in.*	..	..	..	..
a.c.	**Yakumo** . .	9850	407¾	64¼	23¾	16,000 B.	Stettin .	1899	1901	..	7–3½ H. S.	2½	5 H.S.	..	6 H. S.	6 H.S.	4 *8-in.* (A.), 12 *6-in.*, 12 *12-pr.* (A.), 8 *2½-pr.*	5 (4 sub.)	20·0	600 1100	500
b.	**Yamashiro*** . *Pl.* 56 .	31,000	658	94	28½	45,000 tur.	Yokosuka .	1915	..	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 16 *6-in.*, 4 *12-pr.* 3 A.A.	6 (sub.)	22·5	..	..

* Particulars uncertain. † Mutsu and Nagato expected to be launched in October and July, 1919, respectively.

N.B.—The battleship Kawachi was blown up in Tokugama Bay, July 12, 1918, and the battle-cruiser Tsukuba in Yokosuka Harbour, January 14, 1917. The old battleship Tango (*ex* Poltava), 10,960 tons, 4 12-in. and 12 6-in. guns, completed at Petrograd 1898, and captured in the hostilities with Russia, has been employed in the war. The battleship Sagami (*ex* Peresviet), captured in the war of 1904–5, was retroceded to Russia; also the cruiser Soya (*ex* Varyag).

In June, 1918, the Diet accepted a Government programme providing for the building of eight battleships and six cruisers by 1923.

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JAPAN.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l.cr.	**Akashi** . .	2800	295½	41¾	16½	8500	Yokosuka . .	1897	1898	327,000	2	4½ shield	2 *6-in.* (A.), 6 *4·7-in.*, 10 *3-pr.*, 2 *2½-pr.*, 4 M.	2	20·0	200 / 544	300
t.g.b.	**Chihaya** .	1250	273	31½	10	5500 Nor.	Yokosuka . .	1900	1901	..	..	..	2 *4·7-in.*, 4 *12-pr.* . . .	2	21·0	123 / 344	170
l.cr.	**Chitose** . . .	4992	395	49	18	15,500	San Francisco .	1898	1899	205,200	4½	4½ shield	2 *8-in.*, 10 *4·7-in.*, 12 *12-pr.*, 6 *2½-pr.*	4	22·5	350 / 1000	405
„	**Hirato** . . .	4950	440	46½	16¾	22,500 P. tur. My.	Kobe . .	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M. . .	3 (sub.)	26	500 / 1000	390
Scout	**Mogami** . . .	1329	300	31½	9¾	8000 turbines	Sasebo . .	1907	1908	..	2½	..	2 *4·7-in.*, 4 *12-pr.* . . .	2	23·0	..	180
l.cr.	**Niitaka** . . .	3420	235½	44	16½	10,000 Nic.	Yokosuka . .	1902	1905	..	2½	..	6 *6-in.*, 10 *3-in.*, 4 *2½-pr.* . ..		20·0	600	320
g.b.	**Saga**	785	..	..	..	1600	Sasebo . .	1912	1913	..	..	..	1 *4·7-in.*, 3 *3-in.*, 3 M. . .	..	15	..	..
l.cr.	**Shikuma** . . .	4950	440	46½	16¾	22,500 Cur. t. My.	Sasebo . .	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M. . .	3 (sub.)	26	500 / 1000	390
„	**Suma**	2657	306½	40	[illegible]	8500	Yokosuka . .	1896	1898	237,000	2 shield	4½	2 *6-in.*, 6 *4·7-in.*, 12 *3-pr.*, 4 M.	2	20·0	200	300

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l. cr.	**Tone**	4035	400	48½	16¾	15,000 My.	Sasebo	1907	1908	..	2–3	..	2 *6-in.*, 10 *4·7-in.*, 2 *12-pr.*, 2 l.	3	23·0	750 / 1000	392
Scout	**Tsugaru** (*ex* Pallada)	6630	413½	55¾	21	11,610 My.	Petrograd (Galerny)	1899	1901	..	2½	..	8 *6-in.*, 20 *12-pr.*, 8 *1-pr.*	4	20·0	900 / 1400	422
l. cr.	**Tsushima**	3420	235½	44	16½	10,000 Nic.	Kure	1902	1904	..	2½	..	6 *6-in.*, 10 *3-in.*, 4 *2½-pr.*	..	20·0	600	320
g.b.	**Uji**	620	180½	27¾	10	1000 B.	Kure	1903	1905	..	..	..	4 *12-pr.*, *3* M.	..	13·0	100	150
l. cr.	**Yahagi**	4950	440	46½	16¾	22,500 P. tur. My.	Nagasaki	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M.	3 (sub.)	26	500 / 1000	390
„	**Yodo**	1230	280	32	9¾	6500	Sasebo	1908	1909	..	..	..	2 *4·7-in.*, 4 *12-pr.*	2	22·0	..	180

The light cruisers Takachiho, Kasagi and Otowa were lost in the war, also the destroyers Shirotaye and Tokitsukase and torpedo boat No. 33.

Submarine depôt ship Karasaki (*ex* Ekaterinoslav), 10,500 tons, 5 light guns.

Repair ship Kwanto Maru. Amakusa, mining vessel (*ex* Amur).

Mercantile auxiliaries: Umegaku Maru, Sakaki Maru, Sakura Maru, 3200 tons, 21 knots; Tsijo Maru, Tenjo Maru, 13,400 tons, 20 knots.

Also the cruisers Akitsushima, Hashidate and Itsukushima, 3150–4277 tons, dating from 1893, and the gunboats Tatsuta, 875 tons; Toba, 250 tons; Fushimi, 180 tons; and Sumida, 126 tons.

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NETHERLANDS.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
a.g.b.	Brinio . . .																				
,,	Gruno . . .	520	171	28	9¼	1200	Amsterdam .	1912 1913	1915	..	2 K.S.	¾	..	..	..	2	4 *4·1-in.*, 2 M.	..	16	Oil	49
,,	Friso . . .																				
c.d.s.	De Ruyter . . *Pl.* 61.	5014	316¾	51½	21¾	6377 *t.*	Amsterdam .	1900	1904	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5 *t*	680	444
,,	Hertog Hendrik . *Pl.* 61.	5014	316¾	51½	21¾	6000 Y.	Amsterdam .	1902	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3	16·5	680	444
,,	Jacob van Heemskerck	5211	316¾	51½	21¾	6000 Y	Amsterdam .	1906	1908	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	5 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 6 *3-in.*, 4 *1·4-in.*, 2 l.	3 2 sub.	16·0	680	441
,,	Koningin Regentes *Pl.* 61.	5014	316¾	51½	21¾	7290 Y.	Amsterdam .	1900	1902	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5	680	444
,,	Marten Harpertsz Tromp *Pl.* 61.	5211	316¾	51½	21¾	6377 *t*	Amsterdam .	1904	1906	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*	3 2 sub.	16·5 *t*	680	444
,,	De Zeven Provincien	6525	339½	56	20¼	7500 Y.	Amsterdam .	1909	1910	..	6–4 K.S.	2	..	..	10 K.S.	4 H.S.	2 *11-in.*, 4 *5·9-in.*, 10 *12-pr.*	..	16·0	700	440

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NETHERLANDS.—Cruising Ships.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons	
cr. . .	Celebes . . .	7205	519	52½	18	65,000	Tyenoord .	Proj.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
„ . .	**Gelderland** . . .	3969	310¾	49	17¾	10,000 Y.	Feijenoord .	1898	1900	..	2¼	3, 9	4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„ . .	**Holland** . . .	3847	307	49	17¾	10,000 Y.	Amsterdam .	1896	1898	285,700	2	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·5-in.*, 2 M.	4	19·6 *t*	400	333
„ . .	**Java**	7050	509	52½	18	65,000	Flushing .	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
g. v. . .	**Koetel (I)** . . .	790	179	30¾	11½	1412	Amsterdam .	1898	1899	..	..	..	2 *4·1-in.*, 4 *1·5-in.* . . .	..	13·0	120	97
cr. . .	**Noord-Brabant** . .	3969	310¾	49	17¾	10,000 Y.	Flushing .	1899	1901	..	2¼	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·4-in.*, 4 M. .	4	20·0	850	333
„ . .	**Sumatra** . . .	7050	509	52½	18	65,000	Amsterdam .	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
„ . .	**Utrecht** . . .	3969	310¾	49	17¾	10,000	Amsterdam .	1898	1900	..	2¼	..	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„ . .	**Zeeland** . . .	3847	307	49	17¾	10,589 Y. *t*	Flushing .	1897	1898	285,700	2	3, 9	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 8 *1·4-in.*, 4 M.	4	19·4 *t*	400	333

The cruiser Holland is expected to be scrapped this year. The Java and Sumatra are under construction, and the Celebes has been retarded. Six gun-vessels of small value are in Home waters. There are two modern mine-layers, Medusa and Hydra, two others, Triton and Vulcanus, and five old vessels converted to the same use. Two additional mine-layers, 750 tons, are in hand at Schiedam. In 1919 nine old gunboats are in commission in the East Indies, as well as the flotilla depôt ships Mataram and Koetel; three mine-layers, Assahan, Sardang and Siboga, and four other vessels.

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NETHERLANDS.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
a.g.b.	**Brinio** . . .	520	171	28	9¼	1200	Amsterdam .	1912 1913	1915	..	2 K.S.	¾	..	..	..	2	4 *4·1-in.*, 2 M.	..	16	Oil	49
,,	**Gruno** . . .																				
,,	**Friso** . . .																				
c.d.s.	**De Ruyter** . . *Pl.* 61.	5014	316¾	51½	21¾	6377 *t.*	Amsterdam .	1900	1904	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5 *t*	680	444
,,	**Hertog Hendrik** . *Pl.* 61.	5014	316¾	51½	21¾	6000 Y.	Amsterdam .	1902	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3	16·5	680	444
,,	**Jacob van Heemskerck**	5211	316¾	51½	21¾	6000 Y	Amsterdam .	1906	1908	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	5 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 6 *3-in.*, 4 *1·4-in.*, 2 l.	3 2 sub.	16·0	680	441
,,	**Koningin Regentes** *Pl.* 61.	5014	316¾	51½	21¾	7290 Y.	Amsterdam .	1900	1902	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5	680	444
,,	**Marten Harpertsz Tromp** *Pl.* 61.	5211	316¾	51½	21¾	6377 *t*	Amsterdam .	1904	1906	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*	3 2 sub.	16·5 *t*	680	444
,,	**De Zeven Provincien**	6525	339½	56	20¼	7500 Y.	Amsterdam .	1909	1910	..	6–4 K.S.	2	..	..	10 K.S.	4 H.S.	2 *11-in.*, 4 *5·9-in.*, 10 *12-pr.*	..	16·0	700	440

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NETHERLANDS.—Cruising Ships.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons	
cr.	Celebes	7205	519	52½	18	65,000	Tyenoord	Proj.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
„	Gelderland.	3969	310¾	49	17¾	10,000 Y.	Feijenoord	1898	1900	..	2¼	3, 9	4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Holland	3847	307	49	17¾	10,000 Y.	Amsterdam	1896	1898	285,700	2	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·5-in.*, 2 M.	4	19·6 *t*	400	333
„	Java	7050	509	52½	18	65,000	Flushing	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
g. v.	Koetel (I)	790	179	30¾	11½	1412	Amsterdam	1898	1899	..	..	..	2 *4·1-in.*, 4 *1·5-in.*	..	13·0	120	97
cr.	Noord-Brabant	3969	310¾	49	17¾	10,000 Y.	Flushing	1899	1901	..	2¼	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Sumatra	7050	509	52½	18	65,000	Amsterdam	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
„	Utrecht	3969	310¾	49	17¾	10,000	Amsterdam	1898	1900	..	2¼	..	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Zeeland	3847	307	49	17¾	10,589 Y. *t*	Flushing	1897	1898	285,700	2	3, 9	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 8 *1·4-in.*, 4 M.	4	19·4 *t*	400	333

The cruiser Holland is expected to be scrapped this year. The Java and Sumatra are under construction, and the Celebes has been retarded. Six gun-vessels of small value are in Home waters. There are two modern mine-layers, Medusa and Hydra, two others, Triton and Vulcanus, and five old vessels converted to the same use. Two additional mine-layers, 750 tons, are in hand at Schiedam. In 1919 nine old gunboats are in commission in the East Indies, as well as the flotilla depôt ships Mataram and Koetel; three mine-layers, Assahan, Sardang and Siboga, and four other vessels.

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NETHERLANDS.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
a.g.b.	Brinio „ Gruno „ Friso	520	171	28	9¼	1200	Amsterdam	1912 1913	1915	..	2 K.S.	¾	..	..	..	2	4 *4·1-in.*, 2 M.	..	16	Oil	49
c.d.s.	**De Ruyter** *Pl. 61.*	5014	316¾	51½	21¾	6377 *t.*	Amsterdam	1900	1904	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5 *t*	680	444
„	**Hertog Hendrik** *Pl. 61.*	5014	316¾	51½	21¾	6000 Y.	Amsterdam	1902	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3	16·5	680	444
„	**Jacob van Heemskerck**	5211	316¾	51½	21¾	6000 Y	Amsterdam	1906	1908	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	5 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 6 *3-in.*, 4 *1·4-in.*, 2 l.	3 2 sub.	16·0	680	441
„	**Koningin Regentes** *Pl. 61.*	5014	316¾	51½	21¾	7290 Y.	Amsterdam	1900	1902	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5	680	444
„	**Marten Harpertsz Tromp** *Pl. 61.*	5211	316¾	51½	21¾	6377 *t*	Amsterdam	1904	1906	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*	3 2 sub.	16·5 *t*	680	444
„	**De Zeven Provincien**	6525	339½	56	20¼	7500 Y.	Amsterdam	1909	1910	..	6–4 K.S.	2	..	..	10 K.S.	4 H.S.	2 *11-in.*, 4 *5·9-in.*, 10 *12-pr.*	..	16·0	700	440

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NETHERLANDS.—Cruising Ships.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons	
cr.	Celebes	7205	519	52½	18	65,000	Tyenoord	Proj.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
„	Gelderland.	3969	310¾	49	17¾	10,000 Y.	Feijenoord	1898	1900	..	2¼	3, 9	4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Holland	3847	307	49	17¾	10,000 Y.	Amsterdam	1896	1898	285,700	2	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·5-in.*, 2 M.	4	19·6 *t*	400	333
„	Java	7050	509	52½	18	65,000	Flushing	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
g. v.	Koetel (I)	790	179	30¾	11½	1412	Amsterdam	1898	1899	..	..	..	2 *4·1-in.*, 4 *1·5-in.*	..	13·0	120	97
cr.	Noord-Brabant.	3969	310¾	49	17¾	10,000 Y.	Flushing	1899	1901	..	2¼	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Sumatra	7050	509	52½	18	65,000	Amsterdam	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M.	..	30·0	..	474
„	Utrecht	3969	310¾	49	17¾	10,000	Amsterdam	1898	1900	..	2¼	..	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„	Zeeland	3847	307	49	17¾	10,589 Y. *t*	Flushing	1897	1898	285,700	2	3, 9	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 8 *1·4-in.*, 4 M.	4	19·4 *t*	400	333

The cruiser Holland is expected to be scrapped this year. The Java and Sumatra are under construction, and the Celebes has been retarded. Six gun-vessels of small value are in Home waters. There are two modern mine-layers, Medusa and Hydra, two others, Triton and Vulcanus, and five old vessels converted to the same use. Two additional mine-layers, 750 tons, are in hand at Schiedam. In 1919 nine old gunboats are in commission in the East Indies, as well as the flotilla depôt ships Mataram and Koetel; three mine-layers, Assahan, Sardang and Siboga, and four other vessels.

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NETHERLANDS.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
a.g.b.	Brinio Gruno Friso	520	171	28	9¼	1200	Amsterdam	1912 1913	1915	..	2 K.S.	¾	..	..	..	2	4 *4·1-in.*, 2 M.	..	16	Oil	49
c.d.s.	De Ruyter *Pl. 61.*	5014	316¾	51½	21¾	6377 *t.*	Amsterdam	1900	1904	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5 *t*	680	444
„	Hertog Hendrik *Pl. 61.*	5014	316¾	51½	21¾	6000 Y.	Amsterdam	1902	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3	16·5	680	444
„	Jacob van Heemskerck	5211	316¾	51½	21¾	6000 Y	Amsterdam	1906	1908	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	5 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 6 *3-in.*, 4 *1·4-in.*, 2 l.	3 2 sub.	16·0	680	441
„	Koningin Regentes *Pl. 61.*	5014	316¾	51½	21¾	7290 Y.	Amsterdam	1900	1902	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·5-in.*, 2 M.	3 2 sub.	16·5	680	444
„	Marten Harpertsz Tromp *Pl. 61.*	5211	316¾	51½	21¾	6377 *t*	Amsterdam	1904	1906	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	4 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*	3 2 sub.	16·5 *t*	680	444
„	De Zeven Provincien	6525	339½	56	20¼	7500 Y.	Amsterdam	1909	1910	..	6–4 K.S.	2	..	..	10 K.S.	4 H.S.	2 *11-in.*, 4 *5·9-in.*, 10 *12-pr.*	..	16·0	700	440

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NETHERLANDS.—Cruising Ships.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons	
cr. . .	Celebes . . .	7205	519	52½	18	65,000	Tyenoord .	Proj.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
„ . .	Gelderland. . .	3969	310¾	49	17¾	10,000 Y.	Feijenoord .	1898	1900	..	2½	3, 9	4 *5·9-in.*, 8 *3-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„ . .	Holland . . .	3847	307	49	17¾	10,000 Y.	Amsterdam .	1896	1898	285,700	2	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·5-in.*, 2 M.	4	19·6 *t*	400	333
„ . .	Java	7050	509	52½	18	65,000	Flushing .	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
g. v. . .	Koetel (I) . . .	790	179	30¾	11½	1412	Amsterdam .	1898	1899	..	..	..	2 *4·1-in.*, 4 *1·5-in.* . . .	..	13·0	120	97
cr. . .	Noord-Brabant . .	3969	310¾	49	17¾	10,000 Y.	Flushing .	1899	1901	..	2½	3, 9	10 *4·7-in.*, 2 *3-in.*, 4 *1·4-in.*, 4 M. .	4	20·0	850	333
„ . .	Sumatra . . .	7050	509	52½	18	65,000	Amsterdam .	Bldg.	..	..	..	..	10 *5·9-in.*, 4 *3-in.*, 4 M. . .	..	30·0	..	474
„ . .	Utrecht . . .	3969	310¾	49	17¾	10,000	Amsterdam .	1898	1900	..	2½	..	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 4 *1·4-in.*, 4 M.	4	20·0	850	333
„ . .	Zeeland . . .	3847	307	49	17¾	10,589 Y. *t*	Flushing .	1897	1898	285,700	2	3, 9	2 *5·9-in.*, 6 *4·7-in.*, 4 *2·9-in.*, 8 *1·4-in.*, 4 M.	4	19·4 *t*	400	333

The cruiser Holland is expected to be scrapped this year. The Java and Sumatra are under construction, and the Celebes has been retarded. Six gun-vessels of small value are in Home waters. There are two modern mine-layers, Medusa and Hydra, two others, Triton and Vulcanus, and five old vessels converted to the same use. Two additional mine-layers, 750 tons, are in hand at Schiedam. In 1919 nine old gunboats are in commission in the East Indies, as well as the flotilla depôt ships Mataram and Koetel; three mine-layers, Assahan, Sardang and Siboga, and four other vessels.

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NORWAY.—Armoured Ships.

Class.	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	i ..			in.	in.			knots.	tons.	
c.d.s.	Eidsvold / Norge *Pl. 61.*	3847	290	50½	16½	4500 Y.	Elswick	1900	1901	350,000	6 H.N.S.	2	..	..	6 H.N.S.	6 H.N.S.	2 *8·2-in.*, 6 *5·9-in.*, 8 *12-pr.*, 6 *3-pr.*	2 sub.	16·5 *t*	400 / 600	261
„	Harald Haarfagre	3556	280	48½	16½	3700	Elswick	1896	1898	300,000	7 H.S.	2	..	..	8 H.S.	..	2 *8-in.*, 6 *4·7-in.*, 6 *12-pr.*, 6 *1½-pr.*	2 sub.	17·2 *t*	200 / 500	248
„	Tordenskjold							1897	1899												

Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.b.	Æger	387	108½	29½	8	450	Horten	1892	1893	..	1½	..	1 *8·2-in.*, 1 *2·7-in.*, 2 *1·9-in.*	..	9·0	..	43
g.v.	Frithjof	1349	216½	32¾	13¼	2800	Horten	1896	1898	..	..	..	2 *4·7-in.*, 6 *12-pr.*, 4 *1·4-in.*, 2 1.	3 sub.	15·0	120	156
g.b.	Heimdal	620	167¼	26¾	11¾	700	Christiania	1892	1893	..	..	..	4 *2·5-in.*	..	12·0	92	62
g.v.	Viking	1095	203½	30½	13	2000	Horten	1891	1892	..	1½	..	2 *5·9-in.* (A.), 4 *2·5-in.*, 4 *1·4-in.*, 2 M.	3	15·0	140	156

Eleven Gunboats, of 189 to 280 tons, and of 180 to 450 I.H.P., armed with one large gun and machine guns.

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PORTUGAL.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Adamastor	1962	250	35	14	4000	Leghorn	1896	1897	..	3	5	2 *5·9-in.*, 4 *4·7-in.*, 4 *2·2-in.*, 4 M.	3	18·0 *t*	270	232
„	Almirante Reis (ex Dom Carlos I.)	4100	360	46½	17½	12,500 Y.	Elswick	1898	1899	..	4	..	4 *5·9-in.* (A.), 8 *4·7-in.*, 12 *3-pr.*, 6 *1-pr.*, 4 M.	5 (3 sub.)	22·0	1000	260
g.v.	Patria	620	196¾	27½	8½	1800	Lisbon	1903	1905	..	..	..	4 *4-in.*, 6 *1·8-in.*	..	15·0	..	160
cr.	São Gabriel	1772	246	35½	14¼	4000 N.S.	Havre	1898	1899	..	1½	..	2 *5·9-in.* (*Canet*), 4 *4·7-in.*, 8 *1·8-in.*, 2 M.	1	17·5 *t*	500	200

The old armoured ship Vasco da Gama, 2972 tons, completed at Blackwall in 1878, and partly reconstructed at Leghorn in 1903, possesses no value. The cruiser Republica, 1640 tons, launched at Lisbon in 1901, was lost on the coast of Portugal, August, 1915. Two cruisers of 2500 tons and 20 knots, 2 6-in. and 6 4-in. guns, are proposed. There are several small gunboats for Mozambique and Timor, and some river-gunboats. The Dom Luiz, Patria, Save, and Lurio are the most modern and efficient. Mine-layer, Vulcano, 110 ft. long, 19 ft. 6 in. beam, 400 I.H.P., 12 knots, launched by Thornycroft, 1909. Auxiliary cruiser Pedro Nunes (*ex* Malange), 16 knots, carrying several 4·7-in. guns, has been employed as a transport during the war. The Beira, Bengo, Ibo, Mandovi and Quanza are small gunboats.

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RUSSIA.—Armoured Ships.

(B.S., Black Sea Fleet.)

These tables are printed as a record of the former Imperial Russian Navy. The battleship Slava and armoured cruiser Admiral Makaroff, lost during the war, have been removed from the list. So far as they are known the names given to the ships by the Russian Bolshevist Government have been inserted. In the confusion in the Black Sea some small craft were sunk, and the battleship Ekaterina II, renamed Svobodnaya Rossiya, was torpedoed by the Russian destroyer Kertch. In June, 1918 the whole of the remaining ships returned to Sevastopol.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Normal Coal Supply.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkheads.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns. B.L.R. are of Russian Krupp pattern.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Andrei Pervozvannyi** *Pl. 64.*	17,400	429¾	79¾	28½	17,600 B.	Petrograd (Galerny)	1906	1910	1,170,000	11–6 K.S.	..	K.S.	..	K.S.	K.S.	4 *12-in.*, 14 *8-in.*, 12 *4·7-in.*, 14 smaller	3 sub.	18·0	1500	933
a.c.	**Bayan** . . .	7887	443	75¾	23	16,500 B.	Petrograd (New Admiralty)	1907	1910	..	6¾–4 K.S.	2	3 K.S.	6¾ K.S.	5¾ K.S.	3 K.S.	2 *8-in.*, 8 *6-in.*, 20 *12-pr.*, 4 *6-pr.*, 6 l. and M.	2 sub.	21·0	750 1020	573
b.c.	**Borodino** . . .	32,200	749½	99¼	..	66,000 Y. T.	Petrograd (Galerny)	1915	..	..	12 K.S.	..	..	..	..	..	12 *14-in.*, 21 *5·1-in.*, 4 *3-pr.*	..	27	..	..
b.	**Demokratiya** . . (*ex* Nikolai I)	27,300	597	95	29½	29,700	Petrograd	1916	?	..	..	..	..	..	..	..	12 *12-in.*, 20 *5-in.*, 4 *4-in.* A.A, 4 M.	4	21	..	..
b.	**Evstafi** (Sviatoi), B.S. *Pl. 64.*	12,733	372¼	72¾	27	10,600 B.	Nikolaieff	1906	1911	..	9–3 K.S.	2½	6 K.S.	7–5 K.S.	10 K.S.	5 K.S.	4 *12-in.*, 4 *8-in.*, 12 *6-in.*, 14 *3-in.*, 10 smaller, 6 M., 2 l.	3 sub.	16	670 1400	731
b.	**Gangut** . . . *Pl. 63.*	23,000	590½	87	27¼	42,000 Y. tur.	Petrograd (New Admiralty)	1911	1915	..	11–4 K.S.	3	8 K.S.	4 K.S.	11½ K.S.	5 K.S.	12 *12-in.*, 16 *4·7-in.*, 4 *3-pr.*, 8 M.	4 sub.	23	1200 3000	..
b.	**Gnazhdanin** . . (*ex* Cesarevitch) *Pl. 65.*	12,912	388¾	76¼	26½	16,500 B.	La Seyne	1901	1903	..	9¾–4 K.S.	2½	6 K.S.	9 K.S.	10–11 K.S.	6¾ K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-in.*, 6 *1·4-in.*, 4 M., 2 l.	2 sub.	19·6 *t*	900 1350	732
a.c.	**Gromoboi** . . shd.	13,220	473	68½	26	15,500	Petrograd (Baltic)	1899	1900	..	6 H.S.	3	4¾ H.S.	6 H.S.	6 H.S.	4¾ H.S.	4 *8-in.*, 22 *6-in.*, 20 *3-in.*, 11 small Q.F. and M.	4 sub.	20·0	500 855	814
b.	**Ioann Zlatoust**, B.S. *Pl. 64.*	12,733	372¼	72¾	27	10,600 B.	Sebastopol	1906	1910	..	9–3 K.S.	2½	6 K.S.	7–5 K.S.	12–10 K.S.	5 K.S.	4 *12-in.*, 4 *8-in.*, 12 *6-in.*, 14 *3-in.*, 10 smaller, 6 M., 2 l.	5 sub.	16·0	670† 1400	636
b.c.	**Ismail** . .	32,200	749½	99¼	..	66,000 Y. tur.	Petrograd (Baltic)	1915	..	..	12 K.S.	..	..	..	..	..	12 *14-in.*, 24 *5·1-in.*, 4 *4-in.* A.A.	6	27	..	..
b.c.	**Kinburn** . .																				
b.	**Ivan Grosnyi**, B.S.	22,500	551½	89½	27¼	26,500 tur.	Nikolaieff (Russian Co.)	Bldg.	..	..	12 K.S.	3	8 K.S.	..	12 K.S.	5 K.S.	12 *12-in.*, 20 *5-in.*	4 sub.	21·0	3000	..

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b.c.	**Navarin** . . .	32,200	749½	99½	..	66,000 Y. tur.	Petrograd (New Admiralty)	1915	..	..	12 K.s.	..	..	..	..	..	12 *14-in.*, 21 *5·1-in.*, 4 *3-pr.*	..	27	..	..
b.	**Petropavlovsk** .	23,000	590½	87	27½	42,000 Y. tur.	Petrograd (Baltic)	1911	1915	2.800,000	11–4 K.s.	3	8 K.s.	4 K.s.	11½ K.s.	5 K.s.	12 *12-in.*, 16 *4·7-in.*, 4 *3-pr.*, 8 M.	4 sub.	23·0	1200 3000	..
b.	**Poltava** . . *Pl.* 63.						Petrograd (New Admiralty)	1911	1915	2,800,000											
b.	**Republika** . . . (*ex* Pavel I) *Pl.* 64.	17,400	429¾	79¾	28½	17,600 B.	Petrograd (Baltic)	1907	1911	1,170,000	11–6 K.s.	2½	5 K.s.	..	12 K.s.	7 K.s.	4 *12-in.*, 14 *8-in.*, 12 *4·7-in.*, 14 smaller.	3 sub.	18·0	1500	933
a.c.	**Rossia** . . shd.	12,195	480	68½	26	18,420 B.	Petrograd .	1896	1897	..	10–5 H.s.	2½	4 H.s.	6 H.s.	2 H.s.	2 H.s.	4 *8-in.*, 22 *6-in.*, 31 smaller Q.F. & M.	2	20·0	2500 §	725
b.	**Rostislav**, B.S. . .	8880	341	66½	24	8700	Nikolaieff .	1896	1900	..	15¾–8 H.s.	2–3	5 H.s.	5 H.s.	15¾ H.s.	6 H.s.	4 *10-in.*, 8 *6-in.*, 16 small & M.	2 sub.	16·0	§550 800	624
a.c.	**Rurik** . . . *Pl.* 66.	15,170	490	75	26	19,700 B.	Barrow . .	1906	1907	..	6–3 K.s.	1½	3 K.s.	3 K.s.	8 K.s.	7 K.s.	4 *10-in.*, 8 *8-in.*, 20 *4·7-in.*, 14 smaller.	2 sub.	21·0	1200 2000	800
b.	**Sevastopol** . . . *Pl.* 63.	23,000	590½	87	27½	42,000 Y. tur.	Petrograd (Baltic)	1911	1915	2,800,000	11–4 K.s.	2	8 K.s.	4 K.s.	11½ K.s.	5 K.s.	12 *12-in.*, 16 *4·7-in.*, 4 *3-pr.*, 8 M.	4 sub.	23·0	1200 3000	..
b.	**Volya** . . . (*ex* Alexander III), B.S. *Pl.* 62.	22,500	551¼	89½	27½	26,500 tur.	Nikolaieff . (Ivanoff)	1914	1915	..	12 K.s.	3	8 K.s.	..	12 K.s.	5 K.s.	12 *12-in.*, 20 *5-in.* .	4 sub.	21·0	3000	..
b.	**Zoretzza Svobodu**, B.S. (*ex* Panteleimon) *Pl.* 65.	12,582	372¼	72¾	27	10,600 B.	Nikolaieff .	1900	1902	..	9-3 K.s.	2½ 2½	5 6 K.s.	.. 7–5 K.s.	12 12–10 K.s.	7 5 K.s.	4 *12-in.*, 16 *6-in.*, 14 *3-in.*, 14 *1·4-in.*	5 sub.	17·0	670†	636

† And liquid fuel, 580 tons. § And liquid fuel.

Also in the Black Sea are the old battleships Tri Sviatitelia (13,400 tons), 1893, and Georgi Pobiedonosetz (11,000 tons), 1892.
The old battleship Alexander II was renamed Zarya Svobodi.

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RUSSIA.—Cruising Ships, &c.

(B.S., Black Sea Fleet.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	ins.				knots.	tons.	
l. cr.	**Almaz**	3285	325	43½	17½	7500 B.	Petrograd (Baltic)	1903	1904	..	2¾	5–3½ K.S.	3 *4·7-in.*, 8 *1·8-in.*, 2 *1·4-in.*, 2 M.	6	19·0	560	340
,,	**Askold**	5905	426½	49¼	20¾	20,420 T.S.	Kiel (Germania)	1900	1901	..	3	4	12 *6-in.*, 12 *3-in.*, 6 *1·8-in.*, 8 smaller Q.F. and M.	6 (2 sub.)	23·8 *t*	720 1100	500
,,	**Aurora**	6731	413¼	55¾	21	11,610 B.	Petrograd (Galerny)	1900	1905	..	2½	..	8 *6-in.*, 20 *3-in.*, 8 smaller Q.F. and M.	3 (2 sub.)	20·0	900 1400	422
g.b.	**Bobr**	875	215¼	35¾	9	800	Petrograd (New Admiralty)	1907	1908	..	..	..	2 *4·7-in.*, 4 *12-pr.*, 3 M.	1	12·0	60	170
l. cr.	**Bogatyr**	6675	416¾	54½	20¾	19,500 Nor.	Stettin (Vulcan)	1901	1902	..	2	5 N.S.	12 *6-in.*, 12 *3-in.*, 6 *1·8-in.*, 8 smaller Q.F. and M.	4 (2 sub.)	24·0 *t*	720 1100	580
,,	**Boutakoff** (Admiral)	7600	519¾	50	18	55,000 C.T	Putiloff	1915	..	..	1	3 side	16 *5·1-in*, 5 *9-pr.*, 4 M.	..	32	..	..
,,	**Diana** (Submarine depôt)	6630	413¼	55¾	21	11,610 B.	Petrograd (Galerny)	1899	1902	..	2½	..	10 *6-in.*, 20 *3-in.*, 18 smaller Q.F. and M.	3 (2 sub.)	20·0	900 1400	422
g.b.	**Gilyak**	875	215¼	35¾	9	800	Petrograd (New Admiralty)	1906	1908	..	..	..	2 *4·7-in.*, 4 *12-pr.*, 3 M.	1	12·0	60	170
l. cr.	**Grieg** (Admiral)	7600	519¾	50	18	55,000 C.T.	Reval	1915	..	..	1	3 side	16 *5·1-in.*, 5 *9-pr.*, 4 M.	..	32	..	..
g.b.	**Koreiets**	875	215¼	35¾	9	800	Petrograd (New Admiralty)	1906	1908	..	..	..	2 *4·7-in.*, 4 *12-pr.*, 3 M.	1	12·0	60	170

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l. cr . .	**Istomin** (Admiral) B.S.	7600	519¾	50	18	55,000 C.T.	Nikolaieff	1915 Bldg. Bldg. 1915	..	..	1	3 (side)	16 *5·1-in.*, 5 *9-pr.*, 4 M. . ..		32	..	..
,, . .	**Korniloff** (Admiral) B.S. . . .																	
,, . .	**Lazareff** (Admiral) B.S. . . .																	
,, . .	**Nakhimoff** (Admiral) B.S. . . .																	
,, . .	**Oleg**	6675	439¾	54½	20½	19,500 Nor.	Petrograd (New Admiralty)	1903	1904	..	2¾	5–3½ K.S.	12 *6-in.*, 12 *3-in.*, smaller, Q.F., & M.	14 2 (sub.)	20·0	600	340
,, . .	**Otchakoff** (ex-Kagul) B.S.	6675	439	54½	20½	19,500 Nor.	Sebastopol .	1902	1905	..	2¾	5–3½ K.S.	12 *6-in.*, 12 *3-in.*, smaller	14 2 sub.	20·0	720 1100	570
,, . .	**Pamyat Mercuria**, B.S. (ex-Kagul) .	6675	439	54½	20½	19,500	Nikolaieff .	1903	1907	..	2¾	5–3½ K.S.	12 *6-in.*, 12 *3-in.*, smaller, Q.F., & M.	14 2 (sub.)	20·0	720	..
2nd cl. *cr*. .	**Spiridoff** (Admiral) .	7600	519¾	50	18	55,000 C.T.	Putiloff Reval	1915	..	..	1	3 (side)	16 *5·1-in.*, 5 *9-pr.*, 4 M. . ..		32	..	..
,, ,, .	**Svietlana** . . .																	

Two light cruisers for the Black Sea were in the programme of 1914, to be built by the Russian Shipbuilding Co., Nikolaieff. The Turkish cruiser Medjidieh, 3432 tons, which was sunk by a mine off the Russian Black Sea Coast, April 3, 1915, was raised and added to the Russian Fleet, but was recaptured at Sebastopol, May, 1918.

Okean, *coal transport*, 12,000 tons, 18 knots, launched at Kiel, 1901. Torpedo transports and mining vessels Minin, General Admiral, Gerzog Edinburgski, Volga, Bakan, Amur, Ladoga, Narova, and Onega. Eight river gunboats (946 tons) built for the Amur, Grosa, Shkwal, Shtorm, Taifun, Smertsh, Uragan, Vichrj, Vjuga. Ten 200-ton gunboats for the same service. Gunboats for the Caspian, Kars and Ardagan, completed 1911. Rynda (1885), 3508 tons, training ship. Submarine salvage vessel Volchoff, 2400 tons, 1000 tons lift, Diesel engines, 10 knots.

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SPAIN.—Armoured Ships.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Alfonso XIII.** *Pl. 67.*	15,460	435	78¾	25½	15,300 Y. P. tur.	Ferrol	1913	1915	..	9–4 K.S.	2–1	6–5 K.S.	6–3 K.S.	10 K.S.	6 K.	8 *12-in.*, 20 *4-in.*, 2 *3-pr.*, 2 l., 2 M.	3	19·5	800 / 1900	700
a.c.	**Cataluña**	6889	347¾	61	21¾	15,000	Cartagena	1900	1903	600,000	12–10	2	..	12	10½	..	2 *9·4-in.*, 8 *5·5-in.*, 8 *6-pr.*, 2 l.	5 sub.	19·5 *t*	1200	484
„	**Emperador Carlos V.** *Pl. 67.*	9089	380	67	25	18,500	Cadiz (Vea Murguia)	1895	1898	734,000	2	6½–2	2	..	10	2	2 *11-in.* (Hontoria), 8 *5·5-in.*, 4 *3·9-in.*, 2 *2·7-in.*, 4 *2·2-in.*, 6 M.	* 6	20·0	1200	535
b.	**España**	15,460	435	78¾	25½	15,300 Y. P. tur.	Ferrol	1912	1914	..	9–4 K.S.	2–1	6–5 K.S.	6–3 K.S.	10 K.S.	6 K.	8 *12-in.*, 20 *4-in.*, 2 *3-pr.*, 2 l., 2 M.	3	20·0 *t* 19·5	800 / 1900	700
b.	**Jaime I.*** *Pl. 67.*							1914	1915												
b.	**Pelayo**	9744	330	66	25	9000 Nic.	La Seyne	1887	1890 1897	..	17¾	4	..	..	19¼	4 H.S.	2 *12·5-in.*, 2 *11-in.*, 9 *5·5-in.*, 6 smaller, 12 M.	7	16·0	800	600
a.c.	**Princesa de Asturias**	6889	347¾	61	21¾	15,000	Carraca	1896	1902	600,000	12–10	2	..	12	10½	..	2 *9·4-in.*, 10 *5·5-in.*, 8 *6-pr.*, 2 l.	5	18·0	1200	500

* Two others of the class are projected.

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SPAIN.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Armour. Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	ins.				knots.	tons.	
g.b.	Bonifaz	800	200	30	..	1100 Y	Cartagena	1912	1913	..	..	..	4 *3-in.*, 2 M.	..	13·0	..	..
to.g.b.	Don Alvaro de Bazán	810	233	26¾	22	2500	Ferrol	1897	1899	..	..	..	2 *4·7-in.* (Hontoria), 4 *1·6-in.*, 2 M.	4	19·0	..	110
„	Doña María de Molina	810	233	26¾	22	2500	Ferrol	1896	1898								
cr.	Extremadura	2030	290	36	14	7000 T	Cadiz	1900	1902	..	2	..	8 *4-in.* (Vickers). 4 *2·2-in.*, 2 *1·4-in.*, 1 l.	..	20·0	480	246
g.b.	Lauria	800	200	30	..	1100 Y	Cartagena	1912	1913	..	..	..	4 *3-in.*, 2 M.	..	13·0	..	..
„	Laya																
to.g.b.	Marqués de la Victoria	810	233	26¾	22	2500	Ferrol	1897	1900	..	..	..	2 *4·7-in.* (Hontoria), 4 *1·6-in.*, 2 M.	4	19·0	..	110
g.b.	Recalde	800	200	30	..	1100 Y	Cartagena	1911	1912	..	..	..	4 *3-in.*, 2 M.	..	13·0	..	..
cr.	Reina Regente	5287	337	529	19¾	6500 W.T.	Ferrol	1906	1908	..	..	3	10 *5·5-in.*, 12 *2·2-in.*, 2 l., 8 M.	3	20·0	1200	497
„	Reina Victoria	5778	364	52½	16½	11,000 T.	Ferrol	1906	1910	..	2 (1½ side)	..	9 *6-in.*, 4 *3-pr.*, 1 l., 4 M.	2 (sub.)	25·5	..	..
„	Rio de la Plata . shd.	1773	246	35½	15	7100 N.S.	Havre	1898	1899	..	..	1	2 *5·5-in.*, 4 *3·9-in.*, 4 *2·2-in.*, 6 M.	2	20·0	270	213

Hernán Cortés, Vasco Nuñez de Balboa, Marqués de Molins, Ponce de Léon, MacMahon, Perla, Nueva España and Temerario, gun-vessels.
The new programme provides for beginning three light cruisers of the 5778-ton class, six destroyers, 28 submarines, three gunboats and other vessels. Including provision of mines, &c., and necessary plant and supplies for the Ferrol and Cartagena dockyards, the cost was estimated as £11,000,000.

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SWEDEN.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s., t.	Aeran *Pl. 68.*	3612	287	49¼	16½	6500 Y.	Gothenburg	1901	1902	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	17·2 *t*	370	250
,,	Dristigheten *Pl. 69.*	3445	285	48½	16	5400 Y.	Gothenburg	1900	1901	..	8 K.S.	1⅞	..	..	8 N.S.	3¾ K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 M.	2 sub.	16·5	300	250
a.c.	Drottning-Victoria *Pl. 69.*	7100	390½	61	21½	20,000 tur. Y.	Gothenburg	1917	..	666,000	8–6 K.S.	12	4 H.S.	..	8 K.S.	5 K.S.	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 4 *1-pr*	2 sub	22·0	350 800	450
,,	Fylgia	4100	377¼	48¾	16	12,440 Y. *t*	Stockholm	1905	1907	385,700	4 K.S.	2	..	..	5 K.S.	5 K.S.	8 *5·9-in.*, 14 *2·2-in.*, 3 *1·4-in.*	2	22·5 *t*	350 900	321
c.d.s., t.	Göta	3238	258½	48	16¾	4750	Gothenburg	1890 1902	1891	..	11¾–8	2	..	..	7½ H.S.	5 H.S.	1 *8·2-in.*, 7 *5·9-in.*, 11 *2·2-in.*, 2 *1·4-in.*	3	16·0	240	150
a.c.	Gustav V. *Pl. 69.*	7100	390½	61	21½	20,000 tur. Y.	Malmö	1917	..	666.000	8–6 K.S.	12	4 H.S.	..	8 K.S.	5 K.S	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 4 *1-pr.*	2 sub.	22·0	350 800	450
c.d.s., t.	Manligheten *Pl. 68.*	3612	287	49¼	16½	7400 Y.	Malmö	1904	1906	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2 2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	17·0	370	250
,,	Njord	3445	278¼	48½	17½	5350	Gothenburg	1898	1899	..	9½ H.N.S.	1⅞	..	..	9⅞ H.N.S.	4 H.N.S.	2 *9·8-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
,,	Oden	3445	278¼	48½	17½	5330	Stockholm	1896	1898	..	9½ H.N.S.	1⅞	..	..	9⅞ H.N.S.	4 H.N.S.	2 *9·8-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
,,	Oscar II *Pl. 68.*	4203	313¾	49½	16¾	8500 Y.	Gothenburg	1905	1907	..	6 K.S.	2	6 K.S.	6 K.S.	7½ K.S.	5 K.S.	2 *8·2-in.*, 8 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	18·0	350 500	326
a.c.	Sverige *Pl. 69.*	7100	390½	61	21½	20,000 tur. Y.	Stockholm	1914	1918	666,000	8–6 K.S.	1½	4 K.S.	..	8 K.S.	5 K.S.	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 4 *1-pr.*	2 sub.	22·0	350 800	450
c.d.s., t.	Tapperheten *Pl. 68.*	3612	287¼	49¼	16½	6000 Y.	Malmö	1901	1904	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	16·5	370	250
,,	Thor	3445	278¼	48½	17½	5350	Stockholm	1898	1890	..	9½ H.N.S.	1⅞	..	..	9⅞ H.N.S.	3¾ H.N.S.	2 *9·8-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
,,	Thule	3248	260¾	48	16¾	4740	Stockholm	1892 1904	1894	..	11¾–8	1⅞	..	..	7½ H.S.	5 H.S.	1 *8·2-in.*, 7 *5·9-in.*, 11 *2·2-in.*, 2 *1·4-in.*	2	16·2 *t*	250	165
,,	Wasa *Pl. 68.*	3612	287	49¼	16½	6000 Y.	Stockholm	1901	1893	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	16·5	370	250

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SWEDEN.—Cruising Ships, &c.

Class.	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.										knots.	tons.	
to.g.b.	Claes Horn . .	787	222	27	10¼	3600	Stockholm .	1899	1900	..	..	..	2 *4·7-in.*, 4 *2·2-in.* . .	1 sub.	20·0	120	110
to.g.b.	Jacob Bagge	787	222	27	10¼	3970	Malmö . .	1898	1899	..	..	..	2 *4·7-in.*, 4 *2·2-in.* . . .	1 sub.	19·5	120	110
	Örnen . .					4100	Gothenburg .	1896	1897						19·5		
„	Psilander . .	787	232	27¼	8¾	4500 Y.	Stockholm .	1900	1901	..	..	..	2 *4·7-in.*, 4 *2·2-in.* . .	1 sub.	20·5 *t*	120	110

Four gunboats of 190 to 200 tons, and about 130 I.H.P. each, and carrying 1 5-in. B.L.R. and 2 M.

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TURKEY.—Armoured Ships.

Under the terms of the armistice concluded October 30, 1918, all warships in Turkish waters, and in waters occupied by Turkey, were to be interned. On November 5, 1918, it was announced that they had been interned at the Golden Horn.

Class.	NAME.	Displacement.	Length.	Beam.	Draugh	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.b.	**Assar-i-Tewfik** .	4613	272½	52½	25	3560	La Seyne .	1868	1870 1906	..	8	..	..	..	6	..	3 *5·9-in.*, 7 *4·7-in.*, 6 *6-pr.* .	..	13·0	400	300
b.	**Turgut Reis*** . .	9901	354¼	65	24¾	9000	Stettin (Vulcan)	1891	1893	450,000	15¾ *comp.*	2½	..	..	11¾ *comp.*	1½	6 *11-in.*, 8 *4·1-in.*, 8 *3·4-in.*, 4 M.	3	17·0	630/1000	..
b.c.	**Sultan Selim** . . (*ex* Goeben)	22,640	610¼	96	27	70,000 P. tur.	Hamburg (Blohm & Voss)	1911	1912	..	7½–4 K.S.	..	..	..	8 K.S.	5 K.S.	10 *11-in.*, 12 *5·9-in.*, 12 *3·4-in.*	4 (sub.)	28·6 *t*	1000/3100	1013

* Ex Weissenburg.

The battleship Kheyr-ed-Din Barbarossa was sunk by British submarine at the entrance to the Sea of Marmora, August 8, 1915.

When the Germans left the Goeben they took with them all fire-control and other scientific instruments.

In the list of Turkish cruising vessels there remain now only the old cruiser Hamidieh, 3,800 tons, completed at Elswick in 1904, about 25 gunboats, of which a dozen or more are modern, and a few mine-laying and other vessels. The light cruiser Breslau (Midillieh), 4500 tons, in the sortie which she made in company with the Goeben (Sultan Selim), January 20, 1918, was driven into a British minefield and sunk.

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UNITED STATES.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. *	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Alabama.**	11,552	368	72¼	24¾	11,207 *t*	Philadelphia	1898	1900	544,539	16½–4 H.S.	2¾–4	5¼ H.S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 8 *6-in.*, 2 *3-in.* A.A., 16 *6-pr.*, 10 *1-pr.*, 4 M., 2 l.	..	21·9 *t*	800 1275	592
b.	**Arizona.** *Pl. 70.*	31,400	600	97	28¾ †	34,000 Y.	New York	1915	1916	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.*, 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.*	4 (sub.)	21·0	2914 Oil	1002
b.	**Arkansas** *Pl. 73.*	26,000	554	93¼	28½ †	28,533 P. tur.	Camden, N.J.	1911	1912	964,000	11–5 K.S.	3	..	8–6 K.S.	11 K.S.	6½	12 *12-in.*, 16 *5-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 4 M., 1 l.	2 (sub.)	21·0 *t*	1650 2500	1115
a. c.	**Brooklyn.**	9215	400½	62	26½	18,425 *t*	Philadelphia	1895	1896	613,583	3 H.S.	6–3	4 H.S.	..	8 H.S.	5½ H.S.	8 *8-in.*, 8 *5-in.*, 2 *3-in.* A.A., 14 *6-pr.*, 10 *1-pr.*, 2 M., 1 l.	..	22·2 *t*	900 1622	718
b.	**California**	32,300	624	97½	30¼	28,500	Mare Island (Navy Yard)	Bldg.	..	..	..	..	..	..	..	..	12 *14-in.* (50 cal.), 14 *5-in.*, 4 *3-in.* A.A., 4 M.	2 (sub.)	21·0	2914 Oil	1067
a. c.	**Charleston**	9700	424	66	35 †	27,500 B.&W.	Newport News	1904	1906	563,030	4 H.S		4 H.S.	..	4 H.S.	..	12 *6-in.*, 4 *3-in.*, 2 *3-in.* A.A., 12 *3-pr.*, 12 *1-pr.*, 10 M., 2 l.	..	22·0	650 1500	664
b.	**Colorado.** *Pl. 76.*	32,600	600	97½	30½ †	28,000 T.	N.Y.S.B. Co.	Bldg.	..	1,383,000	..	..	..	..	..	..	8 *16-in.*, 14 *5-in.*, 4 *3-pr.* A.A., 4 *6-pr.*	2 (sub.)	21·0	..	..
b.	**Connecticut** *Pl. 75.*	16,000	450	76¾	26¾	20,525 B. & W.	Camden, N.J.	1904	1906	819,300	11½ K.S.	3	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 4 *3-pr.*, 21 l., M., and A.A.	4 (sub.)	18·8 *t*	900 2200	803
b. c.	**Constellation** / **Constitution**	35,300	850	91	31¼ †	180,000 T. electric	Newport News / Philadelphia	Bldg.	..	..	..	..	..	..	..	..	8 *16-in.*, 14 *6-in.*, 4 *3-in.* A.A.	8 (4 sub.)	35·0	..	..
b.	**Delaware** *Pl. 74.*	20,000	510	85¼	27 †	29,025	Newport News	1909	1910	817,300	11 K.S.	..	10–8 K.S.	..	11 K.S.	5 K.S.	10 *12-in.*, 14 *5-in.*, 2 *3-pr.*, 2 *3-in.* A.A. 12 l.	2 (sub.)	21·5 *t*	1000 2500	927
b.	**Florida** *Pl. 74.*	21,825	510	88¼	30 †	27,036 tur.	New York	1910	1911	1,280,000	11	..	10	..	11	5	10 *12-in.*, 12 *5-in.*, 4 *6-pr.*, 19 L. and A.A.	2 (sub.)	22·1 *t*	1000 2300	1014
a.c.	**Frederick** (*ex* Maryland) *Pl. 76.*	13,680	502	69½	24½	28,059 B. & W.	Newport News.	1903	1905	756,400	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 4 *3-pr.*, 2 A.A., 14 l.	2 (sub.)	22·4 *t*	900 1850	829
Super-posed turrets.	**Georgia** *Pl. 75.*	14,948	435	76¼	23¾ †	25,088 *t* Nic.	Bath, Me.	1904	1906	737,700	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 17 l.	4 (sub.)	19·2 *t*	900 1704	812

* The sums given in this column are exclusive of the cost of armour and armament according to the system of making appropriations in the estimates.

† Mean draught.

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UNITED STATES.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.	in.	in.	in.	in.			knots	tons	
a.c.	Huntingdon (*ex* West Virginia) *Pl. 76.*	13,680	502	69½	24½	31,437 B. & W.	Newport News	1903	1905	798,310	6–3½ K.S.	4	5 K.S.	12 H.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 8 *1-pr.*, 4 M., 1 l.	2 (sub.)	22·1 *t*	900 2000	829
b.	Idaho *Pl. 70.*	32,000	624	97¾	31 + +	34,000 Y.	Camden, N.J.	1917	1919	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (50 cal.), 14 *5-in.*, 4 *14-pr.* A.A., 4 *6-pr.*, 4 M.	4 (sub.)	21·0	2914 Oil	1007
b.	Illinois	11,552	368	72¼	24¾	12,757	Newport News	1898	1901	533,237	16½–4 H.S.	2¾–4	5¼ H.S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 8 *6-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 6 *1-pr.*, 17 M., 2 l.	1 (sub.)	17·45 *t*	800 1275	686
b.	Iowa	11,340	366	72¼	27¼	11,933	Philadelphia	1896	1897	618,514	14 H.S.	2¾	5 H.S.	12 H.S.	15 H.S.	8–6 H.S.	4 *12-in.*, 8 *8-in.*, 4 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 19 M. and l.	..	17·1 *t*	625 1795	520
b.	Kansas *Pl. 75.*	16,000	450	77	26¾	19,545 B. & W.	Camden, N.J.	1905	1907	855,850	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 14 M. and l.	4 (sub.)	18·1 *t*	900 2200	854
Super-posed turrets.	Kearsarge / Kentucky	11,520	368	72¼	25	(11,788) / (12,179)	Newport News	1898	1899	462,345 each	16½–4 H.S.	2¾–5	5½ H.S.	..	15 H.S.	9 H.S.	4 *13-in.*, 4 *8-in.*, 8 *5-in.*, 2 *3-in.* A.A., 8 M. and l.	1 / ..	16·8 / 16·9 *t*	410 [illegible]	690 / 686
b.c.	Lexington	35,300	850	91	31¼ + +	180,000 T. electric	Quincy, Mass.	Bldg.	..	..	..	..	..	..	..	..	8 *16-in.*, 14 *6-in.*, 4 *3-in.* A.A.	8 (4 sub.)	35	..	..
b.	Louisiana *Pl. 75.*	16,000	450	76¾	26¾	20,748 B. & W.	Newport News.	1904	1906	819,300	11–8 K.S.	3	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 24 M. and l.	4	18·8 *t*	900 2200	803
b.	Maine	12,500	388	72¼	25½	15,693 Nic.	Philadelphia	1901	1902	592,828	11–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 8 *6-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 8 *1-pr.*, 4 M., 1 l.	2 (sub.)	18·0 *t*	1000 1800	551
b.	Maryland	32,600	600	97¼	30½ + +	28,900 T.	Newport News	Bldg.	..	1,383,000	..	..	..	..	..	..	8 *16-in.*, 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.*	2 (sub.)	21·0	..	..
b.	Michigan *Pl. 74.*	16,000	450	80¼	24½ + +	16,310 B. & W.	Camden, N.J.	1908	1909	700,000	11–9	3	8	10	10–8	8	8 *12-in.*, 14 *3-in.*, 2 *3-in.* A.A., 2 *3-pr.*, 2 M., 1 l.	2 (sub.)	18·8 *t*	900 2200	669
b.	Minnesota† *Pl. 75.*	16,000	450	77	26¾	20,235 B. & W.	Newport News	1905	1907	844,500	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 14 *1-pr.*, 4 M.	4 (sub.)	18·8 *t*	900 2200	881

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b.	***Mississippi*** *Pl. 70.*	32,000	624	97¾	31 ‡	34,000 Y.	Newport News	1917	1917	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (50 cal.), 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.* 14 l.	4 sub.	21·0	2914 Oil	..		
,,	**Missouri**	12,500	388	72½	25½	15,845 T.	Newport News	1901	1903	592,828	12–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 8 *6-in.*, 6 *3-in.* A.A., 4 *3-pr.*, 14 *1-pr.*, 2 M., 1 l.	2 sub.	18·1 *t*	1000 1836	551		
a.c.	**Montana** *Pl. 76.*	14,500	502	72¾	27 ‡	27,938 B. & W.	Newport News	1906	1908	970,630§	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 12 *3-in.*, 4 *3-in.* A.A., 4 *3-pr.*, 10 *1-pr.*, 4 M., 1 l.	4 sub.	22·2 *t*	900 2000	845		
Superposed turrets.	**Nebraska** *Pl. 75.*	14,948	435	76¼	23¾ ‡	21,283 B. & W.	Seattle.	1904	1907	767,213	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 20 *1-pr.*, 4 M., 1 l.	4 sub.	19·1 *t*	900 1900	812		
b.	**Nevada** *Pl. 71.*	27,500	575	95	28½ ‡	24,800 Cur. tur.	Quincy, Mass.	1914	1915	1,211,342	13½–8 K.S	1½–3	13½–8 K.S.	13½ K.S.	18–16 K.S.	5 K.S.	10 *14-in.*, 12 *5-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 18 l. & M.	4 sub.	20·5	1300 2000	..		
b.	**NewHampshire** *Pl. 75.*	16,000	450	77	26¾ ‡	19,100 B. & W.	Camden, N.J.	1906	1908	1,600,000 (Total)	9–4 K.S.	3	7 K.S.	7 K.S.	12 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 14 *1-pr.*, 4 M.	4 sub.	18·2 *t*	900 2350	916		
Superposed turrets.	**New Jersey** *Pl. 75.*	14,948	435	76¼	23¾ ‡	23,089 B. & W.	Quincy, Mass.	1904	1906	699,680	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 8 *1-pr.*, 4 M., 1 l.	4 sub.	19·4 *t*	900 1900	812		
b.	**New Mexico** (originally California) *Pl. 70.*	32,000	624	97¾	31 ‡	34,000 Y. Electric drive	New York	1917	1918	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (50 cal.), 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.* 6 l. & M.	4 (sub.)	21·0	2914 Oil	..		
,,	**New York** *Pl. 72.*	27,000	565	95½	28½ ‡	35,000	New York	1912	1914	1,315,114	12–4 K S.	3	9 K.S.	10 K.S.	14–8 K.S.	6 K.S.	10 *14-in.*, 16 *5-in.*, 2 *3-in.* A.A., 4 *3-pr.* 13 l. & M.	4 sub.	21·5	2200 2850	1074		
a.c.	**North Carolina** *Pl. 76.*	14,500	502	72¾	25 ‡	29,785 B. & W.	Newport News	1906	1908	970,630§	5–3 K.S.	3	5 K.S.	9 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 15 M. & l.	4 sub.	21·9 *t*	900 2000	845		
b.	**North Dakota.** *Pl. 74.*	20,000	510	85	28¾ ‡	31,826 Cur. tur.	Quincy, Mass.	1908	1910	899,500	11 K.S.	..	10–8 K.S.	..	11 K.S.	5 K.S.	10 *12-in.*, 14 *5-in.*, 2 *3-in.* A.A., 2 *3-pr.*, 14 l, 4 M.	2 sub.	21·0 *t*	1000 2500	960		
b.	**Ohio** .	12,500	388	72½	25½	16,220 T.	S. Francisco.	1901	1904	595,705	11·4 K.S.	3–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 8 *6-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 16 *1-pr.*, 2 M., 1 l.	2 sub.	17·8 *t*	1000 2144	521		
b.	**Oklahoma** *Pl. 71.*	27,500	575	95	29¾ ‡	24,800	New York	1914	1915	2,200,000	13½–8 K.S.	1½–3	13½–8 K.S.	13½ K.S.	18–16 K S.	5 K S.	10 *14-in.*, 12 *5-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 19 l. & M.	4 sub.	20·5	1300 2000	..		
b.	**Pennsylvania.** *Pl. 70.*	31,400	600	97	29¾ ‡	31,500 *t* Y.	Newport News	1915	1916	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.*, 12 *5-in.*, 4 *3-in.* A.A., 4 *3-pr.*, 14 l., 4 M.	4 sub.	21·0	2914 Oil	1002		

* See note on p. 331. † Minnesota was injured by a mine, Sept. 29, 1918, but reached port. ‡ Mean Draught. § Including armour but not armament.

Armoured cruiser Milwaukee, 9700 tons, wrecked on the Pacific coast.

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UNITED STATES.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. *	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Pittsburg** . *Pl.* 76.	13,680	502	69½	26	28,600 Nic.	Philadelphia (Cramp)	1903	1905	799,340	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 18 *1-pr.*, 8 M., 1 l.	2 sub.	22·4 *t*	900 / 2000	829
a. c.	**Pueblo** . (*ex* Colorado) *Pl.* 76.	13,680	502	69½	24½	26,837 Nic.	Philadelphia	1903	1905	756,000	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 12 *1-pr.*, 4 M., 1 l.	2 (sub.)	22·2 *t*	900 / 2000	829
b.c.	**Ranger** .	35,300	850	91	31½ †	180,000 T. electric	Newport News	Bldg.	..	..	..	..	..	..	..	..	8 *16-in.*, 14 *6-in.*, 4 *3-in.* A.A.	8 (4 sub.)	35	..	..
Super-posed	**Rhode Island** . *Pl* 75.	14,948	435	76¼	26 †	20,310 B. & W.	Quincy, Mass.	1904	1906	699,680	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 8 *1-pr.*	4 sub.	19·0 *t*	900 / 1900	812
a.c.	**Rochester** . (*ex* Saratoga)	8200	380½	64¾	26¼ †	17,075	Philadelphia (Cramp)	1891	1893 1909	613,377	4 H.S.	2½	.. K.S.	..	6½ H.S.	5–4 H.S.	4 *8-in.*, 8 *5-in.*, 2 *3-in.* A.A., 19 l. & M.	..	21·0 *t*	750 / 1334	498
a.c.	**St. Louis** .	9700	424	66	22½ †	27,264 B. & W.	Philadelphia (Cramp)	1905	1906	563,030	4 K.S.	3	4–3	..	4 K.S.	..	12 *6-in.*, 4 *3-in.*, 2 *3-in.* A.A., 2 *3-pr.*, 12 l. & M.	..	22·1 *t*	650 / 1500	664
b.c.	**Saratoga** .	35,300	850	91	31½ †	180,000	N.Y. Ship-building Co.	Bldg.	..	..	..	..	..	..	..	..	8 *16-in.*, 14 *6-in*, 4 *3-in.* A.A	8 (4 sub.)	35	..	..
"	**No. 6** .						Philadelphia (Navy Yard)	Pro.													
a.c.	**Seattle** . (*ex* Washington) *Pl.* 76.	14,500	502	72¾	27	27,152 B. & W.	Camden, N.J.	1905	1906	970,630‡	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 4 M., 11 l.	4 sub.	22·3 *t*	900 / 2000	858
b.	**South Carolina** *Pl.* 74.	16,000	450	80¼	27 †	18,357 B. & W.	Philadelphia (Cramp)	1908	1909	700,000	11–9	3	8	10	10–8	8	8 *12-in.*, 14 *3-in.*, 2 *3-in.* A.A., 4 M., 11 l.	2 sub.	18·9 *t*	900 / 2200	669
a.c.	**South Dakota** . *Pl.* 76.	13,680	502	69½	26	28,598 B. & W.	S. Francisco.	1904	1907	770,570	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 6 *3-in.*, 2 *3-in.* A.A., 7 *1-pr.*, 1 l.	2 sub.	22·0 *t*	900 / 2000	829

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b.	**Tennessee**	32,300	600	97½	30½ †	28,000 T.	New York	1919	..	..	..	..	..	..	..	..	12 *14-in.* (50 cal.), 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.*, 6 l.	2 sub.	21·0	2941 Oil	1007
b.	**Texas** *Pl. 72.*	27,000	565	95½	28½ †	28,100 *t*	Newport News	1912	1914	1,166,000	12–4 K.S.	3	9 K.S.	10 K.S.	14 8 K.S.	6 K.S.	10 *14-in.*, 16 *5-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 13 l.	4 sub.	21·1 *t*	2200 2850	1074
b.	**Utah** *Pl. 74.*	21,825	510	88½	28½	28,477 *t.*, P. tur.	Camden, N.J.	1909	1911	813,500	11	..	10	..	11	5	10 *12-in.*, 12 *5-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 4 M., 1 l.	2 sub.	21·6 *t*	1000 2300	1014
t.	**Vermont** *Pl. 75.*	16,000	450	77	26¾	17,982 B. & W.	Quincy, Mass.	1905	1907	858,730	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 8 *1-pr.*, 2 M., 1 l.	4 sub.	18·33 *t*	900 2200	854
Super-posed	**Virginia** *Pl. 75.*	14,948	435	76½	23¾ †	22,841 Nic.	Newport News	1904	1906	737,700	11–8 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *3-in.*, 2 *3-in.* A.A., 8 *1-pr.*, 2 M., 1 l.	4 sub.	19·0 *t*	900 1900	812
b.	**Washington**	32,600	600	97½	30½ †	28,900 T.	N.Y.S.B. Co. Newport News	Bldg.	..	1,383,000	..	..	..	..	..	..	8 *16-in.*, 14 *5-in.*, 4 *3-in.* A.A., 4 *6-pr.*	2 sub.	21·0	..	..
b.	**West Virginia**																				
t.	**Wisconsin**	11,552	368	72½	26	12,452	S. Francisco.	1898	1901	549,666	16½–4 H.S.	3–4	5¼ H.S.	..	15 H.S.	6 H.S.	4 *13-in.*, 8 *6-in.*, 2 *3-in.* A.A., 16 *1-pr.*, 4 M., 1 l.	1	17·2 *t*	800 1310	583
b.	**Wyoming** *Pl. 73.*	26,000	554	93¼	29¾ †	31,437 P. tur.	Philadelphia	1911	1912	963,800	11–9 K.S.	..	..	8–6 K.S.	11 K.S.	8	12 *12-in.*, 16 *5-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 4 M., 13 l.	2 sub.	21·2 *t*	1650 2500	1115
b.	**Nos. 49–54**	43,200	660	101¾	33 †	60,000 T. elec.	..	Pro.	..	..	..	..	..	..	..	..	12 *16-in.*, 16 *6-in.*, 4 *3-in.* A.A.	2 sub.	23·0	..	..

* See note on page 331. † Mean draught. ‡ Including armour, but not armament.

The old battleships Indiana (1895), Oregon (1896), and Massachusetts (1896) are still retained in the official lists. Also the monitors Amphitrite and Monadnock, 3990 tons, Tonopah (*ex* Nevada), 3714 tons, Tallahassee (*ex* Florida) and Ozark (*ex* Arkansas), 3235 tons, Cheyenne (*ex* Wyoming), 3218 tons, Monterey, 4084 tons.

The Idaho is approaching completion, and the Tennessee and California are well advanced. Ten others are building, or to be built, under the three years' programme of August 29, 1916. The Colorado, Maryland, Washington and West Virginia are under construction; in January, 1918, no progress had been made with the remaining vessels of the programme, to which the names of South Dakota, North Carolina, Montana, Indiana, Massachusetts and Iowa had been assigned (Nos. 49 to 54). Four of them are under contract. Work on the battleships recently begun and on the six battle-cruisers of the same programme has been stopped, pending possible changes in design.

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UNITED STATES.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built	Date of Launch.	Date of Completion.	Cost. *	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l. cr.	Albany . shd.	3487	346	43¾	29	7500	Elswick .	1899	1900	247,611	3	3–1¼ shields	8 *5-in.*, 1 *3-in.* A.A., 2 *3-pr.*, 2 *1-pr.*, 4 M., 1 l.	..	20·5 *t*	512 / 747	356
g.v.	Asheville . .	1575	225	41¼	11¼†	800	Charleston .	1918	..	176,718	..	..	3 *4-in.*	..	12	..	..
scout	Birmingham .	3750	420	47	18¾†	15,670 Express	Quincy, Mass.	1907	1908	301,000	2–1½	.	4 *5-in.*, 2 *3-in.*, 1 *3-in.* A.A., 4 M.	2 sub.	24·3 *t*	1250 / 1433	356
l. cr.	Chattanooga shd..	3200	292	44	17	5303 B.&W.	Elizabeth Port	1903	1904	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 2 M., 1 l.	..	16·65 *t*	470 / 700	302
scout	Chester . .	3750	420	47	18¾†	16,000 Nor. turb.	Bath, Me. .	1907	1908	337,000	2–1½	..	4 *5-in.*, 2 *3-in*, 1 *3-in.* A.A., 4 M.	2 sub.	26·5 *t*	1250 / 1433	356
l. cr.	Cincinnati . .	3213	300	42	19½	8,490 B.&W.	Brooklyn .	1892	1894	226,055	2½	4	9 *5-in.*. 1 *3-in.* A.A., 7 *6-pr.*, 2 *1-pr.*, 2 M.	..	19·0	350 / 727	314
,,	Cleveland . shd..	3200	292	44	17	4640 B.&W.	Bath, Me. .	1901	1903	212,325	2	..	6 *5-in.*, 4 *6-pr.*, 1 *3-in.* A.A., 2 *1-pr.*, 2 M., 1 l.	..	16·4 *t*	470 / 700	302
,,	Columbia . .	7350	412	58¼	24½	18,509	Philadelphia	1892	1894	559,950	4-2½	4 shield	1 *8-in.*, 3 *6-in.*, 7 *4-in.*, 2 *3-in.* A A., 4 *1-pr.*, 2 *3-pr.*	..	22·8 *t*	750 / 1670	477
,,	Denver } shd.	3200	292	44	17	4135 B. & W.	Philadelphia Quincy, Mass.	1902	1904	212,325	2	..	6 *5-in.*, 4 *6-pr.*, 1 *3-in.* A.A., 2 *1-pr.*, 4 M., 1 l.	..	16·65	470 / 700	303
,,	Des Moines }																
g.v.	Dubuque . .	1085	174	35	13	1193 B. & W.	Morris Heights, N.Y.	1904	1905	60,619	..	..	2 *4-in.*, 4 *6-pr.*, 2 *1-pr.*, 3 M.	..	12·9	200	162
l. cr.	Galveston . shd.	3200	292	44	17	5073 B. & W.	Richmond, Va.	1903	1904	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 4 M., 1 l.	..	16·4	470 / 700	302

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			tons.	ft.	ft.	ft.				£	in.	in.			knots.	tons.	
l. cr.	**Minneapolis**		7350	412	58¼	24½	20,862	Philadelphia	1893	1894	552,754	4–2½	4 shield	3 *6-in.*, 4 *4-in.*, 2 *3-in.* A.A., 2 *1-pr.*, 2 M.	..	23·0 *t*	750 / 1433	477
,,	**New Orleans**	shd.	3487	346	43¾	19	7500	Elswick	1896	1898	293,684	..	3–1¼ shields	8 *5-in.*, 1 *3-in.* A.A., 2 *3-pr.*, 2 *1-pr.*, 4 M.	..	20·0	512 / 767	366
g.v.	**Paducah**		1085	174	35	13¼	1000 B.&W.	Morris Heights, N.Y.	1904	1905	72,948	..	..	4 *4-in.*, 4 *6-pr.*, 2 *1-pr.*, 4 M.	..	12·85	200	162
g.v.	**Sacramento**		1425	225	40¾	11½	1022	Philadelphia	1913	1914	101,200	..	..	3 *4-in.*, 2 *3-pr.*, 2 M., 2 l.	..	12·8 *t*	428	156
scout	**Salem**		3750	420	47	18¾	22,242 W.T. turb.	Quincy, Mass.	1907	1908	301,000	2–1½	..	4 *5-in.*, 2 *3-in.*, 1 *3-in.* A.A., 2 M.	2 sub.	25·9 *t*	1250 / 1433	356
l. cr.	**Tacoma**	shd.	3200	292	44	17	5288 B.&W.	S. Francisco.	1903	1904	212,325	..	2 shields	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 4 M.	..	16·6 *t*	470 / 700	302
sc. cr.	**Nos. 4, 5, 6**		7100	556½	65	14¼	90,100	Seattle Constr. Co.	Bldg.	..	..	..	..	8 *6-in.*, 2 *14-pr.*, 2 *3-pr.*	2 twin	35	Oil	..
,,	**Nos. 7, 8**		7100	556½	65	14¼	90,100	Bath, Me.	Pro	..	..	..	..	8 *6-in.*, 2 *14-pr.*, 2 *3-pr.*	2 twin	35	Oil	..
,,	**Nos. 9, 10**		7100	556½	65	14¼	90,100	Philadelphia (Cramp)	Bldg.	..	..	..	..	8 *6-in.*, 2 *14-pr.*, 2 *3-pr.*	2 twin	35	Oil	..
,,	**Nos. 11, 13**		7100	556½	65	14¼	90,100	Philadelphia (Cramp)	Pro.	..	..	..	..	8 *6-in.*, 2 *14-pr.*, 2 *3-pr.*	2 twin	35	Oil	..

* Prices exclusive of armament.

Older light cruisers Baltimore, Concord, Yorktown, Raleigh, and San Francisco, the first and last named converted into mine-layers. Gun vessels Helena, Machias, Marietta, Nashville, Newport, Princeton, Vicksburg, Wheeling, and Wilmington, 1000 to 1392 tons, launched 1895–97. Fleet colliers Prometheus and Vestal (12,500 tons) converted into repair ships; Jason, Jupiter, Neptune, Nereus, Orion and Proteus, 19,350 tons; Mars and Vulcan, 11,250 tons. Two large oil-transports, Kanawha and Maumee (14,500 tons), and three more are under construction; Ulysses and Achilles, colliers, for the Panama Canal. River gunboats, Monocacy and Palos, completed 1914. Torpedo depôt Castine, 1177 tons. Melville, mother-ship for destroyers, launched March, 1915, Camden, N.J., 7300 tons, 8 5-in. guns, 15 knots, complement 356. Three tenders, two ammunition ships, one transport, and one hospital ship are to be built.

Training ships, Olympia, 5870 tons; Chicago, 4500 tons; Anniston (*ex* Marblehead), 2089 tons. Torpedo experimental vessel, Montgomery, 2089 tons.

The ocean liners St. Louis and St. Paul, 11,629 tons, New York and Philadelphia, 10,802 tons, 20 knots (International Navigation Co.), and the Korea and Siberia, 11,200 tons, 18 knots (Pacific Mail Steamship Co.) are enrolled auxiliary cruisers. Niagara, submarine tender.

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SHIPS BELONGING TO POWERS WHOSE NAVIES ARE OF LESSER IMPORTANCE.

Bulgaria.—Eleven steamers of small size, of which one was used as the Royal yacht. Two armoured gunboats for the Danube built at Leghorn. The Nadiezda, despatch vessel (715 tons), launched Bordeaux, 1898; 18·85 knots; 2 3·9-in., 3 1·8-in. Q.F., and 2 torpedo tubes. Three 100-ton 26-knot torpedo-boats launched 1907; three smaller. Four or more German submarines were sent overland to Varna in October, 1915.

Colombia.—Cruiser Almirante Lezo (*ex* El Baschir), 1200 tons; 2500 H.P.; 18 knots; built 1892, bought from Morocco. Gunboats, Chercinto and Bogota. River gunboats, General Nerino and Esperanza, 400 tons. Three Yarrow motor gunboats, 1913.

Cuba.—Cruiser Cuba, 2055 tons, 3500 H.P., 18 knots, and four gunboats.

Ecuador.—The torpedo cruiser Almirante Simpson, 812 tons, bought from Chili. One torpedo-boat and two transport vessels.

Egypt.—The Nile stern-wheel gunboats Sultan, Sheikh and Melik, 140 tons, Fateh and Naseh, 128 tons; also the Abu Klea, Hafir, Metemmeh, and Tamai. Abdel, Monaym and Abbas, coast-guard vessels, submarined November 5, 1915, Eastern Mediterranean.

Hayti.—Steel gunboat—Capois la Mort, 260 tons, 1 3·9-in., and 4 1-pr. Q.F. Iron corvette—Dessalines, 1200 tons, armed with 1 3·9-in. Q.F., 2 3·9-in. B.L., 2 1., 2 M. Two sloops—St. Michael and 1804. Gun-vessel, 22nd of December. Umbria, cruiser, of 2245 tons.

Mexico.—Two gun-vessels, Tampico and Vera Cruz, launched Elizabethport, New Jersey, 1902; displacement, 980 tons; armament, 4 4-in. Q.F., 6 6-pr.; bow torpedo tube; 2400 I.H.P.; speed, 16 knots; fitted to serve as transport for 200 troops. Gun vessels Bravo and Morero, 1200 tons; 2600 I.H.P.; Blechynden boilers; 17 knots; launched Leghorn, 1904. The Zaragoza, 1200 tons, 1300 H.P., 15 knots speed, and armed with 4 4·7-in. guns and 4 small quick-firing guns. Gun-vessel, Democrata, 450 tons; 11 knots; 2 6½-in. muzzle-loaders and 2 small guns. Torpedo transport General Guerrero, 1880 tons; 1200 I.H.P.; completed at Barrow 1908. Two small gunboats of 10 knots speed. Five torpedo-boats. Two cruisers, 2400 tons, to be built.

Peru.—Almirante Grau and Coronel Bolognesi, cruisers, 3200 tons, 370 ft. long, 40 ft. 6 in. beam, 14 ft. 3 in. draught; Barrow,

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1906; 2 6-in., 8 14-pdr., 8 1½-pdr.; 2 submerged torpedo tubes; 1½-in. armoured deck, 3-in. conning tower; 14,000 I.H.P.; 24 knots. Eclaireur, cruiser, 1769 tons, launched 1877, partially reconstructed; bought from France. Armoured cruiser Dupuy de Lôme, purchased for £140,000, and renamed Elias Aguirre. Lima, 1700 tons, 1800 I.H.P., 16 knots; armament, 2 6-in. guns. Destroyer, Rodriguez, 500 tons, and submarines, Ferré and Palacios, built Le Creusot, 1912–13. Screw steamer, Santa Rosa, about 400 tons.

Roumania.—Elizabeta, protected cruiser (deck 3 in.), built in 1887 at Elswick; 230 ft. long, 32 ft. 10 in. beam; 1320 tons; 3000 I.H.P.; armament, 4 5·9-in. B.L.R., 4 Q.F., 2 M., 4 torpedo tubes. Composite gunboat Mircea, 360 tons; Grivitza, 110 tons. Two gunboats, 45 tons, and 3 first-class torpedo-boats. For the Danube, the gunboats Fulgurul, Oltul, Siretul, Bistritza, 90 to 100 tons, Alexandru cel Bun, 104 tons, 5 sloops, 2 small torpedo-boats and the river monitors Lascar Catargi, Ion Bratianu, Mihail Kogalniceanu, and Alandro Lahovary (600 tons), 3 4·7-in. guns. The shipbuilding programme included 4 other monitors and torpedo-boats and vedettes for the Danube; also 6 coast-defence vessels, 4 destroyers, and 12 torpedo-boats for the Black Sea. Four destroyers (1350–1450 tons). See Flotilla list.

Santo Domingo.—The Independencia, built in England 1894, 170 ft. long, 25 ft. broad, displacement 322 tons, and armed with seven Hotchkiss quick-firing guns. Restauracion, steel gun-vessel, 1000 tons, launched at Glasgow in 1896. The 14-knot cruiser Presidente has been reconstructed, and carries seven guns.

Sarawak.—Two gunboats, of 175 and 118 tons respectively.

Siam.—Deck-protected cruiser, Maha Chakrkri, 290 ft. long, 39 ft. 4 in. beam, of 2500 tons displacement and 17 to 18 knots speed; armament, four 4·7-in. and ten 6-pdr. quick-firing guns. Makut-Rajakamar, 650 tons. The gunboats Bali, Muratha, and Sugrib, 600 tons, one 4·7-in. Q.F., five 2·2 in., four 1·4 in., 12 knots, launched 1898 and 1901. Several other gunboats. Three modern despatch vessels 100 to 250 tons. Three 380-ton, 27-knot destroyers, built at Kobe.

Uruguay.—Gunboats: General Artigas, 274 tons, 12½ knots speed, 2 4·7-in. (Krupp), 2 M.; and General Saurez, 300 tons. The cruiser Uruguay, built at the Vulcan Yard, Stettin; 1100 tons; 2 4·7-in., 4 12-pdr., 12 Maxims; 2 18-in. torpedo tubes; 5700 I.H.P.; 23 knots.

Venezuela.—Gunboats Bolivar, 571 tons, 18·6 knots, and Miranda, 200 tons, 12 knots; transports Restaurador, 568 tons, and Zamora, 350 tons. Maresa Sucre (ex Isla de Cuba), drill ship, bought from United States, 1912.

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BRITISH AND FOREIGN FLOTILLAS.

Great Britain.

Name or Number.	Built by.	Launched or Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
Great Britain.													
T.B.D.			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
FLOTILLA LEADERS.													Oil.
Swift	Cammell Laird	1909	345	34·6	10·6	2	1800	30,000	35	4 4 in.	2	150	180
Faulknor, Broke, *Tipperary, Botha	J. S. White	1914	320	32·6	11	3	1700 to 1740	30,000	31·5	6–4 in. Q.F. 1–1½ prs.	4	160	Oil. 83 Coal. 403
Lightfoot	,,	1915											
Marksman	Hawthorn	1915											
Nimrod	Denny	1915											
Kempenfelt, †Abdiel, Gabriel, Ithuriel, Parker, Grenville, *Hoste, Seymour, Saumarez	Cammell Laird	1915 1916	315	31·9	10	3	1610 to 1680	36,000	34	4–4 in. Q.F. 2–2 prs.	4		Oil. 515
Anzac	Denny	1917											
Valkyrie	,,												
Valorous	,,												Oil.
Valentine, Valhalla, Vampire	Cammell Laird ,, J. S. White	1917	300	29·6	9	2	1320 to 1340	27,000	34	4–4 in. Q.F. 1–3 in. A.A.	4		367
Shakespeare	Thornycroft	1917											
Spenser	,,	1917											
Wallace	,,												Oil.
Keppel, Rooke, †Saunders, †Sprague	,,		318	31·9	10·6	2	1750	43,500	36·5	5–4·7 in. 1–3 in. A.A.	6		500
*Scott, Bruce, Douglas, Campbell, Mackay *ex*-Clavershouse, Malcolm	Cammell Laird	1918	320	31·9	10·6	2	1800	42,500	36·5	5–4·7 in. 1–3 in. A.A.	6		Oil. 500
Montrose, Stuart	Hawthorn												
Pl. 23.	,,												
TORPEDO-BOAT DESTROYERS.													
Conflict	White	1894	205·6	20	..	2	320	4,370	27·21	1–12 pr. 5–6 prs.	2	50	60
Fervent	Hanna	1895	200	19	7·8	2	275	3,800	[27]	1–12 pr. 5–6 prs.	1	50	7
Opossum	Hawthorn	1895	200	19	5·2	2	295	4,052	28·24	1–12 pr. 5–6 prs.	2	50	60
Porcupine (A)	Palmer	1895	200	19·7	6·5	2	275	3,866	27·91	1–12 pr. 5–6 prs.	1	50	60
Sunfish	Hawthorn	1895	200	19	5·2	2	295	4,292	27·62	1–12 pr. 5–6 prs.	2	50	4
Surly	Thomson	1894	205·6	19·5	5·25	2	280	4,400	28·05	1–12 pr. 5–6 prs.	1	50	60
Zephyr	Hanna	1895	200	19	5·3	2	275	3,850	[27]	1–12 pr. 5–6 prs.			

All destroyers from A to F classes are now on the non-effective list.

(A) A class. * Lost during the war or sunk in battle. For a full list of losses see Pt. IV. ‡ Fitted as mine-layer.

† The contracts for the Saunders and Sprague were cancelled after the Armistice.

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Great Britain—*continued.*

Name or Number.	Built by.	Launched or Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
TORPEDO-BOAT DESTROYERS—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Albatross ..	Thornycroft ..	1898	227·6	21·25	8·5	2	430	7,900	31·5	1–12 pr. 5–6 prs.	2	68	100
Angler	,, ..	1897	210	19·6	7·1	2	310	5,800	30·37	1–12 pr. 5–6 prs.	2	60	80
Arab	Brown & Co. ..	1901	218	20·0	5·6	2	470	6,000	31	1–12 pr. 5–6 prs.	2	60	80
Avon	Vickers	1896	210·6	21·6	5·6	2	355	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Bat	Palmer	1896	215	20·75	6·8	2	360	6,185	30·1	1–12 pr. 5–6 prs.	2	60	91
Brazen	Brown & Co. ..	1896	218	20·0	5·6	2	345	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Bullfinch ..	Earle's Co.	1898	210	20·6	5·8	2	345	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Crane	Palmer	1896	215	20·7	6·8	2	360	6,336	30·3	1–12 pr. 5–6 prs.	2	60	80
Cygnet	Thornycroft ..	1898	210	19·5	7·2	2	335	5,800	30·3	1–12 pr. 5–6 prs.	2	60	80
Cynthia	,, ..	1898	210	19·5	7·2	2	355	5,800	30·2	1–12 pr. 5–6 prs.	2	60	80
Desperate	,, ..	1896	210	19·6	7·2	2	310	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Dove	Earle's Co.	1898	210·0	20·6	5·8	2	345	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Earnest	Laird	1896	210·6	21·7	5·3	2	355	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
Electra	Brown & Co. ..	1896	218	20·0	5·6	2	350	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Express	Laird	1897	227·6	22·0	9	2	465	9,000	31	1–12 pr. 5–6 prs.	2	60	80
Fame	Thornycroft ..	1896	210·6	19·6	7·1	2	310	5,800	30·16	1–12 pr. 5–6 prs.	2	60	80
Fawn	Palmer	1897	215	20·7	6·8	2	360	6,581	30·5	1–12 pr. 5–6 prs.	2	60	91
FlyingFish ..	,, ...	1897	215	20·7	6·8	2	360	6,416	30·4	1–12 pr. 5–6 prs.	2	58	91
Foam	Thornycroft ..	1896	210	19·6	7·1	2	310	5,800	30·18	1–12 pr. 5–6 prs.	2	58	80
Gipsy	Fairfield	1897	227·6	22·0	9	2	355	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Greyhound ..	Hawthorn	1900	210	21	8·6	2	385	6,000	30	1–12 pr. 5–6 prs.	2	60	90
Griffon	Laird	1896	210·0	20	5·3	2	355	6,000	30·11	1–12 pr. 5–6 prs.	2	58	80
Kestrel	Brown & Co. ..	1898	218	20·0	5·6	2	350	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Kangaroo ..	Palmer	1900	215	20·75	6·8	2	370	6,500	30	1–12 pr. 5–6 prs.	2	60	91
Leopard	Vickers	1897	210	20·0	5·6	2	350	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Leven	Fairfield	1898	218·0	20·0	5·6	2	370	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Lively	Laird	1900	218	20·0	5·6	2	385	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Locust .. (B)	,, ...	1896	210	21·7	5·3	2	355	6,000	30·16	1–12 pr. 5–6 prs.	2	58	80
Mallard	Thornycroft ..	1896	210·6	19·6	7·1	2	310	5,800	30·11	1–12 pr. 5–6 prs.	2	60	80
Mermaid	Hawthorn	1898	210	21·0	8	2	355	6,000	30	1–12 pr. 5–6 prs.	2	60	82
Orwell	Laird	1898	218·0	20·0	5·6	2	360	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Osprey	Fairfield	1897	227·6	22·0	9	2	355	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Ostrich	,, ...	1900	210	21·0	9	2	375	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Otter	Vickers	1896	210	20·0	5·6	2	350	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Panther	Laird	1897	210·6	21·7	5·3	2	355	6,000	30·14	1–12 pr. 5–6 prs.	2	58	80
Petrel	Palmer	1899	215	20·8	..	2	370	6,200	30	1–12 pr. 5–6 prs.	2	62	85
Quail	Laird	1895	213·6	21·6	5·3	2	355	6,000	30·38	1–12 pr. 5–6 prs.	2	58	90
Racehorse ..	Hawthorn	1900	210	21	8·6	2	385	6,000	30	1–12 pr. 5–6 prs.	2	60	99
Roebuck	,, ...	1901	210	21	8·6	2	385	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Seal	Laird	1897	218·0	20·0	5·6	2	355	6,000	30·15	1–12 pr. 5–6 prs.	2	58	81
Spiteful	Palmer	1899	215	20·75	6·8	2	365	6,500	30·1	1–12 pr. 5–6 prs.	2	62	80
Sprightly ..	Laird	1900	218	20·0	5 6	2	385	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Stag	Thornycroft ..	1900	210	19·75	7 2	2	320	5,800	30 34	1–12 pr. 5–6 prs.	2	60	91
Star	Palmer	1896	215	20·75	6 88	2	360	6,266	30·7	1–12 pr. 5–6 prs.	2	58	43
Success	Doxford	1901	210·0	21·0	9·2¼	2	380	6,000	30	1–12 pr. 5–6 prs.	2	62	80
Sylvia	,, ...	1897	210	19·9	7·6	2	350	5,400	30	1–12 pr. 5–6 prs.	2	58	00
Syren	Palmer	1900	215	20·75	6·8	2	390	6,500	30	1–12 pr. 5–6 prs.	2	..	91
Thorn	Brown & Co. ..	1900	210	21	5·5	2	380	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Thrasher ..	Laird	1895	210·6	21·7	5·3	2	355	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
Vigilant ..	Brown & Co. ..	1900	210	21	5·5	2	380	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Violet	Doxford	1897	210	20·75	6·88	2	350	5,400	30	1–12 pr. 5–6 prs.	2	58	80
Virago	Laird	1895	210·6	21·7	5·3	2	355	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
Vixen	Vickers	1900	210·0	20·0	5·8	2	400	6,000	30	1–12 pr. 5–6 prs.	2	62	88
Whiting	Palmer	1896	215	20·75	6·88	2	360	6,239	30·2	1–12 pr. 5 6 prs.	2	58	80
Exe	Palmer	1903	225	23¼	10	2	540	7,000	25·64		2	70	127
Ribble	Yarrow	1904	225	23¼	10	2	550	7,500	26		2	70	120
Usk	Yarrow	1903	225	23¼	10	2	550	7,500	26		2	70	120
Teviot	,, ...	,,	225	23¼	10	2	550	7,500	26		2	70	120
Ettrick	Palmer	,,	225	23¼	10	2	540	7,000	25·56		2	70	127
Arun	Laird	,,	225	23¼	10	2	550	7,000	25·72	4-12 prs	2	70	130
Cherwell	Palmer	,,	225	23¼	10	2	540	7,000	25·6		2	70	127
Dee	,, ...	1904	225	23¼	10	2	540	7,000	25·5		2	70	127
Jed .. .. (E)	Thornycroft ..	1903	222	23¼	9·6	2	640	7,500	25·78		2	70	126
Kennet	,, ..	1902	222	23¼	9·6	2	640	7,500	25·99		2	70	126
Velox	Parsons	1903	210	23	8¼	8	440	8,000	27	1-12 pr. 5-6 prs.	2	63	130
Waveney ..	Hawthorn	1904	220	23¼	10	2	534	7,000	25 62	4-12 prs.	2	70	130
Welland	Yarrow	1904	225	23¼	10	2	550	7,500	26		2	70	120
Chelmer ..	Thornycroft ..	1904							25·7				
Boyne	Hawthorn	1905	222	33¼	9·6	2	600	7,500	25·72	4-12 prs.	2	72	95 (126
Colne	Thornycroft ..	1904							25·57				

All destroyers from A to F classes are now on the non-effective list.

(B) B, C, and D classes. (E) E class.

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Great Britain—*continued.*

Name or Number.	Built by.	Launched or Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
TORPEDO-BOAT DESTROYERS—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Doon	Hawthorn	1903							25·8				
Garry	Yarrow..	1905							26·5				
Rother	Palmer	1904							25·51				
Liffey	Laird	1904	222	23¼	9·6	2	600	7,500	25·51	4–12 prs.	2	72	95/126
Nith	White	1905							25·69				
Ouse .. .. (E)	Laird	1905							25·56				
Swale	Palmer	1905							25·59				
Wear	,, ...	1905							25·62				
Albacore ..	Palmer *b*	1908	215	21	7	..	440	6,000	26 75	3–12 prs.	2	43¼	..
Bonetta													
Stour	Cammell Laird ..	1909	220	23·9	7·11	..	566	7,000	25·58 / 25·62	4–12 prs.	2	..	66¼
Test													
OCEAN-GOING DESTROYERS.													Oil.
Afridi	Armstrong	1907	250	25	8·5	3	872	14,250	32·75				92½
Cossack	Cammell Laird ..	1907	270	26	9·3	3	890	14,000	33·15	5–12 prs.	2	60	78
Mohawk ..	White	1907	270	25	8·10	3	865	14,500	34·51				74
Tartar	Thornycroft ..	1907	270	26	9·1	3	870	14,500	35·67				76
Saracen .. (F)	White	1908	272	26	9·5	3	980	15,500	33·8	2·4-in. B.L.	2	67	84
Amazon	Thornycroft ..	1908	280	26½	9·2	3	970		33·73				86
Crusader ..	White	1909	280	26	9·8	3	1045	15,500	35				99
Viking	Palmer	1909	280	27·3	8·7	3	1090	15,500	..	2·4-in. B.L.	2	71	102½
Zubian (*c*) ..	Hawthorn	1918	280	27	8·9	3	1027	15,500	34				94¢
Basilisk ..	White	1910	275	28			984		27·98				
Beagle	John Brown ..	1909	269	26·7			940		27·12				
Bulldog	,, ..	1909	269	26·7			940		27·4				
Foxhound ..	,, ..	1909	269	26·7			940		27·7				
Grasshopper ..	Fairfield	1909	271	27¼			890		27·04				Coal
Harpy	White	1909	275	28	8·6	3	984	12,500	27·75	1·4-in., 3–12 prs.	2	96	120
Mosquito ..	Fairfield	1910	271	27¼			890		27·12				
Nautilus (G)	Thames Ironworks	1910	267¼	28			964		28·1				
Rattlesnake ..	Lond. & Glasgow Co.	1910	270¼	27¼			938		27·03				
Renard	Cammell Laird ..	1909	266	28			920		27·14				
Savage	Thornycroft ..	1910	264	28	9·3	3	885		27·16				
Scorpion	Fairfield	1910	271	27·9	..	3	890	12,500	27·1	1·4-in., 3–12 prs.	2	96	..
Scourge	Hawthorn	1910	266¼	28	8·6	3	925		27·06				
Acorn		1910							27·22				
Alarm	John Brown ..	1910							27·2				
Brisk		1910							27·6				
Cameleon ..		1910	240	25·6	7·10	3	780	13,500	28·03	2·4-in. B.L., 2–12 prs.	2	72	Oil.
Comet	Fairfield	1910							27·9				165
Goldfinch ..		1910							28				
Fury	Inglis	1911							27·3				
Hope	Swan, Hunter ..	1910							27·1				
Lance		1910							28·72				
Lyra .. .. (H)	Thornycroft ..	1910							28·88				
Martin		1910							28·9				
Minstrel		1911							28·9				
Nemesis		1910	240	25·6	7·10	3	780	13,500	27	2·4-in. B.L., 2–12-prs.	2	72	165
Nereide	Hawthorn	1910							27·8				
Nymphe		1911							27·5				
Redpole		1910							29·8				
Rifleman ..	White	1910							29·3				
Ruby		1910							30·23				
Sheldrake ..	Denny	1911							28·3				
Acheron	Thornycroft	1911	251¾	26·4	8·7¼	2	780	15,500	29·4	2 4-in. Q.F., 2 12-prs.	2	72	165
Archer	Yarrow	1911	240	25·7	8·5	2	780	16,000	30·9	2 4-in. Q.F., 2 12-prs.	2	72	165

All destroyers from A to F classes are now on the non-efficient list.

(*c*) The Zulu and the Nubian having both been damaged, the effective parts of these vessels were joined together and the new boat named the Zubian.

(E) E class. (F) F class. (G) G class. (H) H class.

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Great Britain—*continued.*

Name or Number.		Built by.	Launched or Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*contd.*				Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Badger		Parsons	1911	240	25·10	8·4	2	780	16,500	..	2 4-in. Q.F., 2 12-prs.	2	72	165
Beaver		Parsons	1911											
Defender		Denny	1911							28·3				
Druid		Denny	1911							..				
Ferret		White	1911							30·2				
Forester		White	1911							29·8				
Goshawk		Beardmore	1911							..				
Hind		John Brown	1911							28·1				
Hornet	(I)	John Brown	1911	240	25¼	7·10	3	750	13,500	..	2 4-in. Q.F., 2 12-prs.	2	72	165
Hydra		John Brown	1912							..				
Jackal		Hawthorn	1911							26·9				
Tigress		Hawthorn	1911							28·6				
Lapwing		Cammell Laird	1911							..				
Lizard		Cammell Laird	1911							..				
Sandfly		Swan, Hunter	1911							27·7				
Firedrake		Yarrow	1912	255	25·7	8·6	2	860	20,000	33·2	2 4-in. Q.F., 2 12-prs.	2	72	165
Lurcher		Yarrow	1912							35·3				
Oak		Yarrow	1912							32·4				
Acasta		John Brown	1912	260	27	9·4	3	935	24,500	29	3 4-in.	2	100	250
Achates		John Brown	1912							32·3				
Ambuscade		John Brown	1913							30·4				
Christopher		Hawthorn	1912	260	27	9·4	3	935	24,500	29	3 4-in.	2	100	250
Cockatrice		Hawthorn	1912							30·9				
Garland	(K)	Cammell Laird	1913	260	27	9·2½	2	952	24,500	31	3 4-in.	2	100	..
Hardy		Thornycroft	1912	257	26½	8·0	..	935	24,500	32	3 4-in.	2	100	..
Midge		London and Glasgow Co.	1913	260	27	9·4	3	935	24,500	32·9	3 4-in.	2	100	250
Owl		London and Glasgow Co.	1913											
Porpoise		Thornycroft	1913											
Unity		Thornycroft	1913	257	26½	9·2½	2	928	22,500	30·8	3 4-in.	2	100	250
Victor		Thornycroft	1913											
Spitfire		Swan, Hunter	1912	260	27	9·4	3	935	24,500	30·3	3 4-in.	2	100	250
Laforey		Fairfield	1913	260	27·8	9·5	2	965	24,500	29	3 4-in	..	100	250
Lawford		Fairfield	1913											
Lydiard		Fairfield	1914											
Leonidas		Palmer	1913											
Lucifer		Palmer	1913											
Llewellyn		Beardmore	1913											
Lennox		Beardmore	1914											
Laertes		Swan, Hunter	1913											
Lysander		Swan, Hunter	1913											
Laurel		White	1913											
Liberty		White	1913											
Loyal		Denny	1913											
Legion		Denny	1914											
Lance		Thornycroft	1914											
Lookout		Thornycroft	1914											
*Lark		Yarrow	1913											
Linnet		Yarrow	1913											
Laverock		Yarrow	1913											
Landrail		Yarrow	1914											
Lassoo		Beardmore	1914											
Lochinvar		Beardmore	1914											
Milne		John Brown	1915	265	26·8	..	3	1,010	25,000	34	3 4-in. Q.F., 1¼-pr. & 1 M.	4	..	250 to 280
Moorsom		Swan, Hunter	1914											
Morris		Swan, Hunter	1914											
Matchless		Swan, Hunter	1914											
Murray		Palmer	1914											
Myngs		Palmer	1915											
Miranda		Yarrow	1914	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	250 to 280
Minos		Yarrow	1914											
Manly		Yarrow	1914											
Mentor		Hawthorn	1915	265	27·3	..	2	980	26,500	35				
Mansfield		Hawthorn	1915											
Meteor		Thornycroft	1914	265	27	..	2	1,055	27,000	35				
Mastiff		Thornycroft	1914											
Maenad		Denny	1915											
Magic		J. S. White (*b*)	1916											
Mandate		Fairfield	1915											
Manners		,,	1915											
*Marmion		Swan Hunter	1915											
Marne		J. Brown	1915											
Martial		Swan Hunter	1915											
Marvel		Denny	1915	265	26·8	8·8	3	1,000	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Mameluke		J. Brown	1915											
*Mary Rose		Swan Hunter	1916											
*Menace		,,	1916											
Michael		Thornycroft	1915											
Milbrook		,,	1915											

* Sunk in battle or lost during the war.

(I) I class. (K) K class. (*b*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Mindful	Fairfield	1915											
Minion	Thornycroft	1915											
Mischief	Fairfield	1915	265	26·8	8·8	3	1,400	25,000	35	3 4-in. Q.F., 1 2-pr.	4	..	278
Mons	J. Brown	1915											
Moresby	J. S. White (*b*)	1916											
Moon	Yarrow	1915											
Morning Star	,,	1915											
Mounsey	,,	1915	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
Musketeer	,,	1916											
Munster	Thornycroft	1916											
Mystic	Denny	1915											
*Negro	Palmers	1916											
Nepean	Thornycroft	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Nereus	,,	1916											
*Nessus	Swan Hunter	1915											
Nerissa	Yarrow	1916	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
*Nestor	A. Stephen	1916											
Napier	J. Brown	1916											
*Narborough	,,	1916											
Narwhal	Denny	1916											
Nicator	,,	1916											
Nizam	A. Stephen	1916											
Noble	,,	1916											
*Nomad	,,	19 6											
Nonpareil	,,	1916											
Nonsuch	Palmers	1916											
Norman	,,	1916											
Norseman	Doxford	1916											
Northesk	Palmers	1916											
*North Star	,,	1917											
Nugent	,,	1917											
Obdurate	Scotts	1916											
Oberon	Doxford	1916											
Obedient	Scotts	1916											
Observer	Fairfield	1916											
Octavia	Doxford	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Offa	Fairfield	1916											
Onslaught	,,	1916											
Onslow	,,	1916											
*Opal	Doxford	1916											
Ophelia	,,	1916											
Opportune	,,	1916											
Oracle	,,	1916											
Orcadia	,,	1916											
Orford	,,	1916											
Oriana	Fairfield	1916											
Oriole	Palmers	1916											
Orestes	Doxford	1916											
Orpheus	,,	1916											
Osiris	Palmers	1916											
Ossory	J. Brown	1915											
Paladin	Scotts	1916											
Parthian	,,	1916											
*Partridge	Swan Hunter	1916											
Pasley	,,	1916											
Patrician	Thornycroft (*b*)	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
Patriot	,,	1916											
Pelican	Beardmore	1916											
Pellew	,,	1916											
Penn	J. Brown	1916											
Peregrine	,,	1916											
Petard	Denny	1916											
Peyton	,,	1916											
*Pheasant	Fairfield	1916											
Phœbe	,,	1916											
Pigeon	Hawthorn	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Plover	,,	1916											
Plucky	Scotts	1916											
Portia	,,	1916											
Prince	Stephens	1916											
Pylades	,,	1916											
Medina	J. S. White (*c*)	1916											
Medway	,, (*c*)	1916											
Rapid	Thornycroft (*b*)	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
Ready	,,	1916											

* Sunk in battle or lost during the war. (*b*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*cont.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Rival	Yarrow	1916	260·3	25·7	8·11	2	883	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Relentless	"	1916											
Retriever	Thornycroft	1917											
Rosalind	"	1916	265	27·3	8·11	2	980	27,000	36	3-4 in. Q.F., 1 2-pr.	4	..	300
Radiant	"	1917											
Radstock	Swan Hunter	1916											
Raider	"	1916											
*Recruit	Doxford	1917											
Redgauntlet	Denny	1916											
Redoubt	Doxford	1917											
Restless	J. Brown	1916											
Rigorous	"	1916											
Rob Roy	Denny	1916											
Rocket	"	1917											
Romola	J. Brown	1916											
Rowena	"	1916											
Satyr	Beardmore	1917											
Sable	J. S. White (*c*)	1916	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Salmon	Harland & Wolff	1916											
Sarpedon	Hawthorn	1916											
Sceptre	Stephens	1917											
*Setter	J. S. White (*c*)	1917											
Sharpshooter	Beardmore	1917											
*Simoom	J. Brown	1916											
Sorceress	Swan Hunter	1916											
Sturgeon	Stephen	1917											
Skate	J. Brown	1917											
Skilful	Harland & Wolff	1917											
Springbok	"	1917											
Starfish	Hawthorn	1916											
Stork	"	1917											
*Strongbow	Yarrow	1916											
Sabrina	"	1916	260·3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Sybille	"	1917											
*Surprise	"	1217											
Sylph	Harland & Wolff	1817											
Tancred	Beardmore	1917											
Tarpon	J. Brown	1017	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Telemachus	"	1917											
Tempest	Fairfield	1917											
Teazer	Thornycroft	1917											
Taurus	"	1917	265	27·3	8·11	2	980	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Tenacious	Harland & Wolff	1917											
Tetrarch	"	1917											
Thisbe	Hawthorn	1917											
Thruster	"	1917											
Tormentor	Stephens	1917	265	26·1	8·8	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
*Tornado	"	1917											
*Torrent	Swan Hunter	1917											
Torrid	"	1917											
Truculent	Yarrow	1917											
Tyrant	"	1917	260·3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
*Ulleswater	"	1917											
Tirade	Scotts	1917											
Tower	Swan Hunter	1917					1,075						
Trenchant	J. S. White (*c*)	1917	265	26·8	9	2	to 1,090	27,000	36	3 4-in. Q.F. 1 2-pr.	4	..	300
Tristram	" (*c*)	1917											
Ulster	Beardmore	1917											
Ulysses	Doxford	1917											
Umpire	"	1917											
Undine	Fairfield	1917	265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Urchin	Palmers	1917											
Ursa	"	1917											
Ursula	Scotts	1917											
Vancouver	Beardmore	1918											
Vanessa	"	1918											
Vanity	"	1918											
Vanoc	J. Brown	1917											
Vanquisher	"	1917											
Vectis	J. S. White	1917											
Vesa	Doxford	1917	300	29·6	8·10	2	1,275 to 1,320	27,000	34	4 4-in., 1 3-in. A.A.	4	..	367
*Vehement	Denny	1917											
Velox	Doxford	1918											
Vendetta	Fairfield	1917											
Venetia	"	1917											
Venturous	Denny	1617											
Verdun	Hawthorn	1917											

* Sunk in battle or lost in the war. (*b*) Yarrow boilers with superheaters. (*c*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil capacity.
OCEAN-GOING DESTROYER—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Mindful	Fairfield	1915											
Minion	Thornycroft	1915											
Mischief	Fairfield	1915	265	26·8	8·8	3	1,400	25,000	35	3 4-in. Q.F., 1 2-pr.	4	..	273
Mons	J. Brown	1915											
Moresby	J. S. White (*b*)	1916											
Moon	Yarrow	1915											
Morning Star	"	1915											
Mounsey	"	1915	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
Musketeer	"	1916											
Munster	Thornycroft	1916											
Mystic	Denny	1915											
*Negro	Palmers	1916											
Nepean	Thornycroft	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Nereus	"	1916											
*Nessus	Swan Hunter	1915											
Nerissa	Yarrow	1916	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
*Nestor	A. Stephen	1916											
Napier	J. Brown	1916											
*Narborough	"	1916											
Narwhal	Denny	1916											
Nicator	"	1916											
Nizam	A. Stephen	1916											
Noble	"	1916											
*Nomad	"	19 6											
Nonpareil	"	1916											
Nonsuch	Palmers	1916											
Norman	"	1916											
Norseman	Doxford	1916											
Northesk	Palmers	1916											
*North Star	"	1917											
Nugent	"	1917											
Obdurate	Scotts	1916											
Oberon	Doxford	1916											
Obedient	Scotts	1916											
Observer	Fairfield	1916											
Octavia	Doxford	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Offa	Fairfield	1916											
Onslaught	"	1916											
Onslow	"	1916											
*Opal	Doxford	1916											
Ophelia	"	1916											
Opportune	"	1916											
Oracle	"	1916											
Orcadia	"	1916											
Orford	"	1916											
Oriana	Fairfield	1916											
Oriole	Palmers	1916											
Orestes	Doxford	1916											
Orpheus	"	1916											
Osiris	Palmers	1916											
Ossory	J. Brown	1915											
Paladin	Scotts	1916											
Parthian	"	1916											
*Partridge	Swan Hunter	1916											
Pasley	"	1916											
Patrician	Thornycroft (*b*)	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
Patriot	"	1916											
Pelican	Beardmore	1916											
Pellew	"	1916											
Penn	J. Brown	1916											
Peregrine	"	1916											
Petard	Denny	1916											
Peyton	"	1916											
*Pheasant	Fairfield	1916											
Phœbe	"	1916											
Pigeon	Hawthorn	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Plover	"	1916											
Plucky	Scotts	1916											
Portia	"	1916											
Prince	Stephens	1916											
Pylades	"	1916											
Medina	J. S. White (*c*)	1916											
Medway	" (*c*)	1916											
Rapid	Thornycroft (*b*)	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
Ready	"	1916											

* Sunk in battle or lost during the war. (*b*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*cont.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Rival	Yarrow	1916	260·3	25·7	8·11	2	883	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Relentless	"	1916											
Retriever	Thornycroft	1917											
Rosalind	"	1916	265	27·3	8·11	2	980	27,000	36	3-4 in. Q.F., 1 2-pr.	4	..	300
Radiant	"	1917											
Radstock	Swan Hunter	1916											
Raider	"	1916											
*Recruit	Doxford	1917											
Redgauntlet	Denny	1916											
Redoubt	Doxford	1917											
Restless	J. Brown	1916											
Rigorous	"	1916											
Rob Roy	Denny	1916											
Rocket	"	1917											
Romola	J. Brown	1916											
Rowena	"	1916											
Satyr	Beardmore	1917											
Sable	J. S. White (*c*)	1916	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Salmon	Harland & Wolff	1916											
Sarpedon	Hawthorn	1916											
Sceptre	Stephens	1917											
*Setter	J. S. White (*c*)	1917											
Sharpshooter	Beardmore	1917											
*Simoom	J. Brown	1916											
Sorceress	Swan Hunter	1916											
Sturgeon	Stephen	1917											
Skate	J. Brown	1917											
Skilful	Harland & Wolff	1917											
Springbok	"	1917											
Starfish	Hawthorn	1916											
Stork	"	1917											
*Strongbow	Yarrow	1916											
Sabrina	"	1916	260 3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Sybille	"	1917											
*Surprise	"	1217											
Sylph	Harland & Wolff	1817											
Tancred	Beardmore	1917											
Tarpon	J. Brown	1017	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Telemachus	"	1917											
Tempest	Fairfield	1917											
Teazer	Thornycroft	1917	265	27·3	8·11	2	980	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Taurus	"	1917											
Tenacious	Harland & Wolff	1917											
Tetrarch	"	1917											
Thisbe	Hawthorn	1917											
Thruster	"	1917											
Tormentor	Stephens	1917	265	26·1	8·8	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
*Tornado	"	1917											
*Torrent	Swan Hunter	1917											
Torrid	"	1917											
Truculent	Yarrow	1917											
Tyrant	"	1917	260·3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
*Ulleswater	"	1917											
Tirade	Scotts	1917											
Tower	Swan Hunter	1917	265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in. Q.F. 1 2-pr.	4	..	300
Trenchant	J. S. White (*c*)	1917											
Tristram	" (*c*)	1917											
Ulster	Beardmore	1917											
Ulysses	Doxford	1917											
Umpi e	"	1917											
Undine	Fairfield	1917	265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Urchin	Palmers	1917											
Ursa	"	1917											
Ursula	Scotts	1917											
Vancouver	Beardmore	1918											
Vanessa	"	1918											
Vanity	"	1918											
Vanoc	J. Brown	1917											
Vanquisher	"	1917											
Vectis	J. S. White	1917											
Vesa	Doxford	1917	300	29·6	8·10	2	1,275 to 1,320	27,000	34	4 4-in., 1 3-in. A.A.	4	..	367
*Vehement	Denny	1917											
Velox	Doxford	1918											
Vendetta	Fairfield	1917											
Venetia	"	1917											
Venturous	Denny	1617											
Verdun	Hawthorn	1917											

* Sunk in battle or lost in the war. (*b*) Yarrow boilers with superheaters. (*c*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil capacity.
OCEAN-GOING DESTROYERS—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Mindful	Fairfield	1915											
Minion	Thornycroft	1915											
Mischief	Fairfield	1915											
Mons	J. Brown	1915	265	26·8	8·8	3	1,400	25,000	35	3 4-in. Q.F., 1 2-pr.	4	..	278
Moresby	J. S. White (*b*)	1916											
Moon	Yarrow	1915											
Morning Star	"	1915											
Mounsey	"	1915											
Musketeer	"	1916											
Munster	Thornycroft	1916	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
Mystic	Denny	1915											
*Negro	Palmers	1916											
Nepean	Thornycroft	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Nereus	"	1916											
*Nessus	Swan Hunter	1915											
Nerissa	Yarrow	1916	260·3	25·7	8·8	2	883	23,000	35	3 4-in. Q.F., 1 2-pr.	4	..	228
*Nestor	A. Stephen	1916											
Napier	J. Brown	1916											
*Narborough	"	1916											
Narwhal	Denny	1916											
Nicator	"	1916											
Nizam	A. Stephen	1916											
Noble	"	1916											
*Nomad	"	1916											
Nonpareil	"	19 6											
Nonsuch	"	1916											
Norman	Palmers	1916											
Norseman	"	1916											
Northesk	Doxford	1916											
*North Star	Palmers	1916											
Nugent	"	1917											
Obdurate	"	1917											
Oberon	Scotts	1916											
Obedient	Doxford	1916											
Observer	Scotts	1916											
Octavia	Fairfield	1916											
Offa	Doxford	1916											
Onslaught	Fairfield	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Onslow	"	1916											
*Opal	"	1916											
Ophelia	Doxford	1916											
Opportune	"	1916											
Oracle	"	1916											
Orcadia	"	1916											
Orford	"	1916											
Oriana	"	1916											
Oriole	Fairfield	1916											
Orestes	Palmers	1916											
Orpheus	Doxford	1916											
Osiris	"	1916											
Ossory	Palmers	1916											
Paladin	J. Brown	1915											
Parthian	Scotts	1916											
*Partridge	"	1916											
Pasley	Swan Hunter	1916											
Patrician	"	1916											
Patriot	Thornycroft (*b*)	1916											
Pelican	"	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
Pellew	Beardmore	1916											
Penn	"	1916											
Peregrine	J. Brown	1916											
Petard	"	1916											
Peyton	Denny	1916											
*Pheasant	"	1916											
Phœbe	Fairfield	1916											
Pigeon	"	1916											
Plover	Hawthorn	1916	265	26·8	8·8	3	1,010	25,000	34	3 4-in. Q.F., 1 2-pr.	4	..	278
Plucky	"	1916											
Portia	Scotts	1916											
Prince	"	1916											
Pylades	Stephens	1916											
Medina	"	1916											
Medway	J. S. White (*c*)	1916											
Rapid	" (*c*)	1916											
Ready	Thornycroft (*b*)	1916	265	27·3	8·8	2	980	26,500	35	3 4-in. Q.F., 1 2-pr.	4	..	256
	"	1916											

* Sunk in battle or lost during the war.

(*b*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*cont.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Rival	Yarrow	1916	260·3	25·7	8·11	2	883	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Relentless	"	1916											
Retriever	Thornycroft	1917											
Rosalind	"	1916	265	27·3	8·11	2	980	27,000	36	3-4 in. Q.F., 1 2-pr.	4	..	300
Radiant	"	1917											
Radstock	Swan Hunter	1916											
Raider	"	1916											
*Recruit	Doxford	1917											
Redgauntlet	Denny	1916											
Redoubt	Doxford	1917											
Restless	J. Brown	1916											
Rigorous	"	1916											
Rob Roy	Denny	1916											
Rocket	"	1917											
Romola	J. Brown	1916											
Rowena	"	1916											
Satyr	Beardmore	1917											
Sable	J. S. White (c)	1916	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Salmon	Harland & Wolff	1916											
Sarpedon	Hawthorn	1916											
Sceptre	Stephens	1917											
*Setter	J. S. White (c)	1917											
Sharpshooter	Beardmore	1917											
*Simoom	J. Brown	1916											
Sorceress	Swan Hunter	1916											
Sturgeon	Stephen	1917											
Skate	J. Brown	1917											
Skilful	Harland & Wolff	1917											
Springbok	"	1917											
Starfish	Hawthorn	1916											
Stork	"	1917											
*Strongbow	Yarrow	1916											
Sabrina	"	1916	260 3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
Sybille	"	1917											
*Surprise	"	1217											
Sylph	Harland & Wolff	1817											
Tancred	Beardmore	1917											
Tarpon	J. Brown	1017	265	26·8	8·11	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Telemachus	"	1917											
Tempest	Fairfield	1917											
Teazer	Thornycroft	1917											
Taurus	"	1917	265	27·3	8·11	2	980	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Tenacious	Harland & Wolff	1917											
Tetrarch	"	1917											
Thisbe	Hawthorn	1917											
Thruster	"	1917											
Tormentor	Stephens	1917	265	26·1	8·8	2	1,040	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
*Tornado	"	1917											
*Torrent	Swan Hunter	1917											
Torrid	"	1917											
Truculent	Yarrow	1917											
Tyrant	"	1917	260·3	25·7	8·11	2	885	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	256
*Ulleswater	"	1917											
Tirade	Scotts	1917											
Tower	Swan Hunter	1917					1,075						
Trenchant	J. S. White (c)	1917	265	26·8	9	2	to	27,000	36	3 4-in. Q.F. 1 2-pr.	4	..	300
Tristram	" (c)	1917					1,090						
Ulster	Beardmore	1917											
Ulysses	Doxford	1917											
Umpire	"	1917											
Undine	Fairfield	1917	265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in. Q.F., 1 2-pr.	4	..	300
Urchin	Palmers	1917											
Ursa	"	1917											
Ursula	Scotts	1917											
Vancouver	Beardmore	1918											
Vanessa	"	1918											
Vanity	"	1918											
Vanoc	J. Brown	1917											
Vanquisher	"	1917											
Vectis	J. S. White	1917											
Vega	Doxford	1917	300	29·6	8·10	2	1,275 to 1,320	27,000	34	4 4-in., 1 3-in. A.A.	4	..	367
*Vehement	Denny	1917											
Velox	Doxford	1918											
Vendetta	Fairfield	1917											
Venetia	"	1917											
Venturous	Denny	1617											
Verdun	Hawthorn	1917											

* Sunk in battle or lost in the war. (*b*) Yarrow boilers with superheaters. (*c*) White-Forster boilers.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions.			Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
			Length.	Beam.	Draught.								
OCEAN-GOING DESTROYERS—*cont.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Versatile	,,	1918											
Vesper	Stephens	1918	300	29·6	3·10	2	1,275 to 1,320	27,000	34	4 4-in., 1 3-in. A.A.	4	..	367
Verulam	Hawthorn	1917											
Viceroy	Thornycroft	1918											
Viscount	,,	1918											
Vidette	,,	1918	300	30·7	8·10	2	1,315	30,000	35	4 4-in., 1 3-in. A.A.	4	..	365
Violent	Stephens	1918											
Vimiera	Swan Hunter	1917											
Vittoria	,,	1917											
Vivacious	,,	1918											
Vivien	Yarrow	1917	300	29·6	8·10	2	1,275 to 1,320	27,000	34	4 4-in. Q.F., 1 3-in. A.A.	4	..	367
Vortigern	,,	1918											
Voyager	J. S. White	1918											
Wakeful	Stephens	1918											
Walker	J. Brown	1918											
Walpole	Denny	1918											
Walrus	Doxford	..											
Warwick	Fairfield	1918											
Watchman	Hawthorn	1918											
Waterhen	J. Brown	1918											
Wryneck	Palmers	..											
Wessex	,,	..											
Westcott	Hawthorn	1918	300	29·6	8·10	2	1,275 to 1,320	27,000	34	4 4-in., 1 3-in. A.A.	6	..	367
Westminster	Denny	1918											
Whirlwind	Scotts	1918											
Wrestler	Swan Hunter	1918											
Whitley	,,	1918											
Winchelsea	Doxford	..											
Winchester	J. S. White	1918											
Windsor	,,	1918											
Wolfhound	Scotts	1918											
Wolsey	Fairfield	1918											
Woolston	Thornycroft	1918											
Sabre	,,	1918	300	30·7	8·10	2	1,325	30,000	35	4 4-in., 1 3-in. A.A.	6	..	365
Saladin	Stephens	..											
Sardonyx	,,	..											
†Saturn	,,	..											
Scimitar	,,	..											
Scotsman	J. Brown	1918											
Scout	,,	1918											
Scythe	,,	1918											
Seabear	,,	..											
Seafire	,,	..											
Searcher	,,	..											
Seawolf	,,	..											
Senator	,,	..											
Sepoy	Denny	1918											
Seraph	,,	..											
Serapis	,,	..											
Serene	,,	..											
Sesame	,,	..											
Shamrock	,,	..											
Shark	Doxford	..											
Shikari	Swan Hunter	1918											
Sikh	Doxford	..											
Simoom	Fairfield	..											
Sirdar	J. Brown	..											
Somme	Fairfield	..											
Sparrowhawk	Fairfield	..											
Spear	Swan Hunter	..											
Spindrift	Fairfield	..											
Sportive	,,	..											
Splendid	Swan Hunter	..											
Stalwart	,,	..											
Steadfast	,,	..											
Sterling	Palmer	..											
Stonehenge	,,	..											
Stormcloud	,,	..											
Strenuous	,,	..											
Stronghold	Scotts	..											
Sturdy	,,	..											
Success	,,	..											
Swallow	Doxford	..											
Swordsman	Scotts	..											
†Sycamore	,,	..											
Tactician	Stephens	..											
Tara	Beardmore	..											
	,,	..	265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in., 1 2-pr.	6	..	300

† Contracts for the Saturn and Sycamore were cancelled after the Armistice.

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Great Britain—*continued.*

Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
OCEAN-GOING DESTROYERS—*cont.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Tasmania	Beardmore												
Tattoo	,,												
Tenedos	Hawthorn												
Thanet	,,												
Thracian	,,		265	26·8	9	2	1,075 to 1,090	27,000	36	3 4-in., 1 2-pr.	6	..	300
Tilbury	Swan Hunter												
Tintagel	,,												
Turbulent	Hawthorn												
Speedy	Thornycroft												
Torbay	,,												
Toreador	,,		265	27·3	8·11	2	980	27,000	36	3 4-in. 1 2-pr.	6	..	300
Tobago	,,												
Tourmaline	,,												
Tribune	J. S. White												
Trinidad	,,												
Trojan	,,		..	..	..	..	..	..	..	..	..	..	..
Truant	,,												
Trusty	,,												
Tryphon	Yarrow												
Tumult	,,												
Tomahawk	,,		260·3	25·7	8·11	2	885	27,000	36	3 4-in. 1 2-pr.	6	..	255
Turquoise	,,												
Tuscan	,,												
Tyrian	,,												
Torch	,,												
Vansittart	Beardmore												
Vantage	,,												
Venom	J. Brown												
Verity	,,												
Veteran	,,												
Volunteer	Denny												
Votary	,,												
Wager	,,												
Wanderer	Fairfield												
Warren	Chatham												
Watson	Devonport												
Welcome	Hawthorn												
Welfare	,,												
Werewolf	J. S. White												
Westphal	,,												
Westward Ho.	,,												
Wheeler	Scotts												
Whelp	Pembroke						1,300						
Whitehall	Swan Hunter		300	29·6	9·0	2	to 1,350	27,000	34	4 4·7-in., 1 3-in. A.A.	6	..	367
Whitehead	,,												
Whitshed	,,												
Wild Swan	,,												
Willoughby	,,												
Witch	Thornycroft												
Wishart	,,												
Witherington	J. S. White												
Wivern	,,												
Wolverine	,,												
Worcester	,,												
Wrangler	,,												
Wren	Yarrow												
Wye	,,												
Yeoman	,,												
Zealous	,,												
Zebra	,,												
Zodiac	,,												
Medea (*ex* Crite)	J. Brown												
*Medusa (*ex* Lesbos)	,,												
Melampus (*ex* Chios)	Fairfield		265	26·8	8·8	3	1,000	25,000	34	3 4-in., 1 2-pr.	4	..	(Oil 1250
Melpomene (*ex* Samos)	,,												
Talisman	Hawthorn Leslie	1916											
*Turbulent	,, ,,	1916	300	28·6	9·0	2	1,098	25,000	32	5 4-in. Q.F. 1 2-pr.	4	..	(Oil 237
Trident	,, ,,	1916											
Termagent	,, ,,	1916											
*Arno (*ex* Liz)	Ansaldo, Genoa	1915	..	..	..	..	..	8,000	..	4 12-prs.	3	..	..

* Sunk in battle or lost during the war.

Contracts for the following vessels of the W (repeat) class were cancelled after the Armistice:—Welcome, Welfare, Votary, Whitehead, Wave, Weasel, Vashon, Vengeful, Willoughby, Winter, Wellesley, Werewolf, Westphal, Westward Ho, Vigo, Wistful, Virulent, Volage, Volcano, Wheeler, Whip, Whippet, Wager, Wake, Waldegrave, Walton, Yeoman, Zealous, Zebra, Zodiac, Whitaker, Whitebear.

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Great Britain—*continued.*

	Name or Number.	Built by.	Completed.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Shaft Horse-Power.	Mean Speed on trial or expected.	Armament.	Torpedo Tubes.	Complement.	Oil Capacity.
	Torpedo Boats.†			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Pro. 1905–6	5 boats (1–5)	White	1906	175	17¼	5·8	3	235	3,750	26	2 12-prs.	3	35	Oil
	4 boats (6–9)	Thornycroft	1906–7	166¼	17¼	6·3	3	255	3,750	27·3	2 12-prs.	3	35	20
Pro. 1906–7	4 boats (13–16)	White	1907	182	18	5·10	3	256	4,000	26	2 12-prs.	3	..	23·5
	2 boats (17–18)	Denny	1907	180	18	5·6	3	251	4,000	26	2 12-prs.	3	..	
	2 boats (19–20)	Thornycroft	1907–8	178·6	18·3	6.5	3	280	4,000	26	2 12-prs.	3	..	
	2 boats (21–22)	Hawthorn	1907–8	185	18·6	6·6	3	308	4,000	26	2 12-prs.	3	..	
	No 23	Yarrow	1907	177·3	18	5·4	3	253	4,000	26	2 12-prs.	3	..	
	No. 24	Palmer	1908	177	17·9	6·5	3	292	4,000	26	2 12-prs.	3	..	
Pro. 1907–8	4 boats (25–28)	White	1908	182	18	6 6	3	283	4,000	26	2 12-prs.	3	..	25
	2 boats (29–30)	Denny	1908	180	18	5·3	3	259	4,000	26	2 12-prs.	3	..	25¼
	2 boats (31–32)	Thornycroft	1908	178·6	18·75	6·2	3	287	4,000	26·5	2 12-prs.	3	33	24¼
	2 boats (33–34)	Hawthorn	1909	185	18·6	6·5	3	306	4,000	26	2 16-prs.	3	..	23¼
	3 boats (35–36)	Palmer	1909	177	17·9	6 6	3	298	4,000	26	2 12-prs.	3	33	24

† All the older boats have been placed on the non-effective list. The following were lost during the war by mine, submarine attack, collision and wreck: Nos. 046, 9, 10, 11, 12, 13, 24, 90, 96 and 117.

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Great Britain—*continued.*

SLOOPS, MINE-SWEEPERS, AND PATROL BOATS.

Name or Number.	Built by.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Speed.	Completed.	Armaments.	Fuel capacity.	Complement.
SLOOPS.		Feet.	Feet.	Feet.								
Acacia	Swan, Hunter											
Anemone	" "											
Aster	Earles											
Dahlia	Barclay, Curle											
Daphne	" "											
Foxglove	" "											
Hollyhock	" "											
Honeysuckle	Lobnitz											
Jonquil	Connell											
Larkspur	Napier & Miller											
Lilac	Greenock & Grangemouth											
Marigold	Bow											
Bluebell	Scotts											
Daffodill	"											
Iris	Lobnitz											
Lavender	McMillan											
*Laburnum	Connell											
Lily	Barclay, Curle											
Mallow	" "											
Magnolia	Scotts											
Mimosa	Bow											
Primrose	Simons											
Sunflower	Henderson											
Veronica	Dunlop											
Azalea	Barclay, Curle											
*Begonia	" "											
Camellia	Bow											
Carnation	Greenock & Grangemouth											
Clematis	"											
Heliotrope	Lobnitz											
Jessamine	Swan, Hunter											
Myrtle	Lobnitz											
Narcissus	Napier & Miller											
Peony	McMillan	255·3	33·6	11·0	1	1250	2400	17	1915-16	2 4-in. or 4 7-in., 2 3-pr.	260	Coal
Snowdrop	"											
Zinnia	Swan, Hunter											
Alyssum	Earle											
Amaryllis	"											
*Arabis	Henderson											
Buttercup	Barclay, Curle											
Campanula	" "											
Crocus	Lobnitz											
Delphinium	Napier & Miller											
Gentian	Greenock & Grangemouth											
Gladiolus	Connell											
Asphodel	Henderson											
Berberis	"											
Celandine	Barclay, Curle											
Cornflower	" "											
Cyclamen	Lobnitz											
Geranium	Greenock & Grangemouth											
*Genista	Napier & Miller											
Godetia	Connell											
Hydrangea	"											
Lobelia	Symons											
Lupin	"											
Marguerite	Dunlop, Bremner											
Mignonette	" "											
Myosotis	Bow											
*Nasturtium	McMillan											
Nigella	Hamilton											
Pansy	"											
Pentstemon	Workman, Clarke											
Petunia	" "											
Poppy	Swan, Hunter											
*Primula	"											
Rosemary	Richardson											
Snapdragon	Ropner											
Valerian	Renoldson											

* Sunk in battle or lost during the war.

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Great Britain—*continued.*

Name.	Built by	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Speed.	Completed.	Armament.	Fuel Capacity.	Complement.
SLOOPS—*contd.*		Feet.	Feet.	Feet.		Tons.		Knots.				
Verbena	Blyth											
Wallflower	Irvine											
Wistaria	,,											
Aubretia	Blyth											
Heather	Greenock and Grangemouth											
Salvia	Irvine											
Tamarisk	Lobnitz											
Tulip	Richardson											
Viola	Ropner											
Montbretia	Irvine											
Gaillardia	Blyth											
Polyanthus	Lobnitz											
Lychnis	Hamilton											
Hibiscus	Greenock and Grangemouth											
Anchusa	Armstrong											
Bergamot	,,											
Candytuft	,,											
Ceanothus	,,											
Convolvulus	Barclay, Curle											
Eglantine	,,											
Syringa	Workman, Clarke	255·3	33·6	11·0	1	1250	2400	17	(1916–1917)	(2 4-in., or 2 4·7-in., 2 3-prs.)	Coal 260	
Spiræa	Simons											
*Arbutus	Armstrong											
Auricula	,,											
Bryony	,,											
Chrysanthemum	,,											
Ivy	Blyth											
Rhododendron	Irvine											
Sweetbriar	Swan, Hunter											
Tuberose	,,											
Windflower	Workman, Clarke											
Coreopsis	Barclay, Curle											
*Cowslip	,,											
Dianthus	,,											
Gardenia	,,											
Gilia	,,											
Harebell	,,											
Marjoram	Greenock and Grangemouth											
Mistletoe	,,											
Pelargonium	Hamilton											
Saxifrage	Lobnitz											
Silene	Simons											
Pl. 28.												
PADDLE MINE-SWEEPERS.												
*Ascot	Ailsa S.C.											
Eridge	Clyde											
Mellow	Hamilton											
Chepstow	Ayrshire S.C.											
Croxton	,,											
Plumpton	McMillan											
Atherstone	Ailsa S.C.											
Lingfield	Fleming and Ferguson											
Kempton	Ferguson											
Epsom	Brown											
Pontefract	Murdoch and Murray	235	58	6·0	Paddle	810	1400	15	1916	(1 3-in., 1 6-pr., 2 2-pr.)	Coal 150	50
Gatwick	Dundee S.C.											
Doncaster	Ayrshire S.C.											
Chelmsford	Ailsa S.C.											
*Ludlow	Goole											
Newbury	A. & J. Inglis											
Eglinton	Ayrshire S.C.											
Haldon	Dunlop											
Hurst	,,											
Cheltenham	Ardrossan D.D.C.											
Goodwood	Dundee S.C.											
Totnes	McMillan											
Pl. 28.												

* Sunk in battle or lost during the war.

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Great Britain—*continued.*

Name.	Built by	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Speed.	Completed.	Armament.	Fuel Capacity.	Complement.
PADDLE MINE-SWEEPERS—*cont.*		Feet.	Feet.	Feet.		Tons.		Knots.				
Sandown	Dunlop								1916			
Redcar	Ayrshire S.C.								,,			
Shirley	Dunlop								1918			
Banbury	Ailsa S.C.								,,			
Hexham	Clyde								,,			
Lanark	Fleming and Ferguson	235	54	6·9	Paddle	810	1,400	15	,,	1 3-in., 1 6-pr., 2 2-prs.	Coal 150	
Wetherby	Murdoch and Murray								,,			
Lewes	Fleming and Ferguson								,,			
Harpenden	Ailsa S.C.								,,			
Shincliffe	Dundee								,,			
Pl. 28.												
TWIN-SCREW MINE-SWEEPERS.												
Belvoir	Ailsa S.C.							Trial				
Bicester	,,							17·1				
Blackmore Vale	Ardrossan S.C.							16·8				
Cattistock	Clyde S.C.							16·9				
Cotswold	Bow							16·2				
Cottesmore	,,							15·8				
Croome	Clyde S.C.							15·6				
Dartmoor	Dunlop							**16·3**				
Garth	,,							16·4				
Hambledon	Fleming	220	28	7	2	750	1,800	16·7	1917	1 3-in., 1 6-pr., 2 2-prs.	Coal 140	
Heythrop	,,							16·1				
Holderness	Henderson							16·1				
Meynell	,,							16·8				
Muskerry	Lobnitz							**16·9**				
Oakley	,,							15·7				
Pytchley	Napier							16·5				
Quorn	,,							16·1				
Southdown	Simons							15·0				
Tidworth	,,							**16·7**				
Zetland	Murdoch							17·2				
								16·5				
Blackburn												
Burslem												
Clonmel												
Coverley												
Derby												
Gainsboro'												
Gretna												
Lanark												
Munster												
Pontypool												
Sandhurst												
Sherbourne												
Sligo												
Stoke												
Widnes												
Aberdare												
Badminton		220	28·6	7·6	**2**	800	2,200	16	..	2 12-prs., 2 2-prs.		
Bootle												
Cupar												
Fareham												
Harrow												
Holderness												
Kendal												
Shrewsbury												
Southdown												
Sutton												
Tiverton												
Brighton												
Faversham												
Gaddesden												
Melton												
Newark												
Winchester												
Pl. 28.												

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Great Britain—*continued.*

Name.	Built by	Dimensions.			Number of Screws.	Displacement.	Horse-Power.	Speed.	Completed.	Armament.	Torpedo Tubes.	Fuel Capacity.	Complement.
		Length.	Beam.	Draught.									
TWIN-SCREW MINE-SWEEPERS—*cont.*		Feet.	Feet.	Feet.		Tons.		Knots.				Tons	
Ard Patrick Bend Or Rock Sand Sir Bevis	..	276	31¼	12		1320	2500	17		2 4-in.		200	
TUNNEL MINE-SWEEPERS ("Dance" class).													
Cotillion Gavotte Mazurka Pirouette Minuet Quadrille Hornpipe Roger de Coverley Saraband	..	130	26	3¼		280	450	10		1 12-pr., 1 A.A.		38	25
PATROL BOATS.													
Nos. 11–12	White	230	23·9	7·7		573	4000	22	1916	1 4-in. 1 2-pr. 2 A.A.	2	93	53
,, 14	Connell												
,, 15–17	W. Clark												
,, 18	Inglis												
,, 19–20	Northumberland												
,, 21	Russell												
,, 22	Caird												
,, 23	Bertram												
,, 24–25	Harland & Wolff												
,, 26	Tyne												
,, 27	Eltringham												
,, 28	R. Thompson												
,, 29–30	W. Gray												
,, 31	Readhead												
,, 32	Hackness												
,, 33	Napier												
,, 34	B. Curle												
,, 35	Caird	230	23·9	7·8		578	4000	22	1916–1917	2 4-in. 1 2-pr. 4 A.A.	2	93	53
,, 36	Eltringham												
,, 37	W. Gray												
,, 38	W. Hamilton												
,, 39	Inglis												
,, 40	White												
,, 41	Bertram												
,, 46	Hackness												
,, 47–48	Readhead												
,, 49	R. Thompson												
,, 50	Tyne												
,, 52	White												
,, 53–54	B. Curle												
,, 57–58	W. Hamilton												
,, 59	White												
,, 64	Inglis												
Pl. 27.													
PC BOATS.													
Nos. 42–43	Caird	230	25·5	8·4		682	4000	20·5	1917–1918	1 4-in. 2 12-pr. 4 A.A.	4	134	56
,, 44	Eltringham												
,, 45	Gray												
,, 51	Tyne												
,, 55–56	B. Curle												
,, 60 61	W. Clark												
,, 62	Harland & Wolff												
,, 63	Connell												
,, 65	Eltringham	230	26·7	8·0		692	4000	20·5	1917–1918	1 4-in. 2 12-pr.	4	165	56
,, 66	Hackness												
,, 67–68	White												
,, 69–70	W. Clark												
,, 71–74	White												
Pl. 27.													

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Great Britain—*continued.*

Number.	Built by.	Launched.	Dimensions. Length.	Beam.	Number of Screws.	Submerged Displacement.	Indicated Horse-Power.	Speed. Surface.	Submerged.	Armament. Guns.	Torpedo Tubes.	Complement.	Fuel Capacity.
SUBMARINES.			Feet.	Feet.		Tons.		Knots.	Knots.				Tons.
2 (1910-11) E 1–E 2	Chatham	1912											
3 (1910-11) E 4–E 6	Vickers	1912											
2 (1911-12) E 7–E 8	Chatham	1912											
3 (1911-12) E 9–E 11	Vickers	1913-14	181	22½	2	800	1600	15	10	1 3-in.	5 18-in.	28	45
1 (1911-12) S. 1	Scott's'	1914											
2 (1912-13) E 12–E 13	Chatham	1915											
2 (1912-13) E 14 & E 16	Vickers	1915											
1 (1912-13) V. 1	Vickers		..	..	..	..	..	..	..	..	..	..	..
2 (1912-13) W 1–W 2	Armstrong		..	..	..	..	..	..	..	..	..	..	..
1 (1912-13) Nautilus	Vickers..		..	..	..	..	..	..	..	..	..	..	..
2 (1913-14) E 17–E 18	Chatham	1914	..	..	..	..	..	..	..	..	..	..	..
1 (1913-14) F 1	,,	1915	..	..	..	525	900	..	..	..	..	..	..
2 (1913-14) S 2 S 3	Scotts'		..	..	..	..	..	..	..	..	..	..	..
3 (1913-14) V 2 V 4	Vickers		147½	14½	2	460	900	13	8½	..	2 18-in.	..	..
2 (1913-14) W 3–W 4	Armstrong		..	..	..	..	..	..	..	1 3-in.	..	..	..
(1915-18) E class	..	..	181	22½	2	800	1600	15	10	..	5 18-in.	28	45
(1915-18) F class	..	..	..	..	..	525	900	..	..	..	..	..	..
(1915-18) G class	..	..	187	22·6	2	975	1600	14	10	1 3-in., 1 2-pdr. A.A.	4 18-in., 1 21-in.	..	44
(1915-18) H class	..	..	171	15·9	2	500	480	13	10½	..	4 21-in.	..	16
(1915-18) J class*	..	..	275	23	3	1820	3600	19	9½	1 3-in. or 4-in.	6 18-in.	..	91
(1915-18) K class	..	..	338	26½	2	2650	10,000	24	9	1 4-in., 1 3-in. A.A	8 18-in.	..	200
(1915-18) L class	..	..	231	23½	2	1070	2,400	17½	10½	1 3-in. or 4-in.	6 18-in.	..	76

NOTE.—A to D classes are now obsolete.

Many submarines have been lost from the above classes during the war. For the full list see Part IV.

* Six boats of this type have been presented to the Royal Australian Navy.

FLOTILLAS OF THE DOMINIONS.—*Australia.*

Name or Number.	Built by.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
TORPEDO-BOAT DESTROYERS.			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Yarra	Denny	1910	245½	24½	7·8	3	700	9,500	27	1 4-in., 3 12-pdr.	3	66	130
Parramatta	Fairfield	1910	245½	24½	7·8	3	700	9,500	28 48				
Warrego	Fairfield*	1911	245½	24½	7·8	3	700	9,500	28				
Swan	Sydney	1915											
Huon	Sydney	1914	245	21·3	..	3	700	11,300	26	1 4-in., 3 12-prs., 1 M.	3	..	Oil 174
Torrens	Sydney	1915											

* Transported in sections and reconstructed in Australia.

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Argentine Republic.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Corrientes	Yarrow ..	1896	190	19 6	7·4	2	280	4,000	27·4 *t.*	1 14-pr.	3	54	80
Missiones..	Yarrow ..	1896	190	19·6	7·4	2	280	4,000	26·0 *t.*	3 6-pr,	3	54	80
Entre Rios	Yarrow ..	1896	190	19·6	7·4	2	280	4,000	26·7 *t.*	Q.F., 2 M.	3	54	80
Catamarca, Jujuy ..	Germania ..	1911	286·7	27·1	8·6	2	940	18,000	32	4 4-in.	4	110	250*
Cordoba, La Plata ..	Schichau ..	1911	279	29·6	7·3	..	890	19,000	34 7	4 4-in.	4	110	290*
FIRST CLASS—													
2 boats	Thornycroft	1890–1	150	14·5	5·2	2	110	1,500	24·52	3 3-prs.	3	27	22
6 boats	Yarrow ..	1890	130	13·5	6	1	85	1,200	23–24	2 3-pr. Q.F.	2	15	15

Four 950-ton destroyers building at Nantes were taken over for the French Navy in 1914.
The two 150-ft. boats are named Comodoro Py and Murature.
The six 130-ft. boats are named Bathurst, Buchardo, Jorge, King, Pinedo, and Thorne.
* Also oil fuel 50–110 tons.

Former Flotilla of Austria-Hungary.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Tatra, Balaton, Csepel, Orjenn ..	Fiume.. ..	1912 1913	265·9	25·6	8·0	2	787	17,000	33	2 4-in. 4 12-pr.	2	..	..
Huszar	Yarrow ..	1905											
Ulan	Trieste ..	1906											
Uskoke		1907											
Scharfschütze		1907											
Dinara	Fiume ..	1908 1909	219·8	20·3	..	2	394	6,000	(28·5 30)	1 12-pr. 7 3-pr.	2	64	..
Csikos													
Pandur													
Reka													
Turul													
Velebit													
Varasdiner													
Lovcen	Fiume ..	1914–15											
Uszok													
Pukla													
FIRST CLASS—													
Kaiman	Yarrow ..	1905											
Alligator	Trieste ..	1906–7											
Anaconda													
Drache													
Delphin													
Greif													
Hai													
Krokodil													
Moewe													
Narwal													
Pinguin													
Schwalbe			179·9	18·0	8·6	1	197	3,000	26	4 3-pr.	..	25	..
Seehund													
Wal													
Triton													
Alk													
Echse													
Hydra													
Kormoran	Fiume ..	1910											
Krake													
Molk..													
Phönix													
Polyp													
Skorpion													
Boa													
Cobra	Yarrow ..	1898–9	152·6	15·3	7·6	1	133	2,000	24·3	2 3-pr.	3	24	30
Kigyo													
Python													
Viper	Yarrow ..	1896	147·6	14·9	7·6	1	130	2,000	26·5	2 3-pr.	2	26	30
Natter	Yarrow ..	1896	150	17·5	8·8	2	152	2,300	26·5	2 3-pr.	3	..	30
50 E	Trieste ..	1913 1914	188	19·0	5·0	2	246	5,000	28 5	4 3-pr.	2	29	43
51 T—63 T													
64 F—73 F													
74 T—81 T (8) ..													
82 F—97 F (6) ..	Fiume.. ..												
98 M—100 M (3) ..	Monfalcone ..												
SUBMERSIBLES—													
U 1 and 2	Pola	1908–9	100	9·8	..	..	(216 240)	720 200	12·2–7·3	..	3	..	..
U 4	Kiel, Germania	1908	141·8	12·6	..	2	(235 295)	600 320	12–9	..	2	17	..
U 5 and 6	Fiume.. ..	1909									5	..	..
U 11, 14, 15	Fiume.. .. Kiel, Germania	1914 1915	105	21·0	..	..	(235 500)	500	11·4–10	1 14-pr.			
Zenta (ex-Curie) ..	Cherbourg ..	1911	160	10·4	13·6	2	390	340	24 12½	..	7	24	..

About twenty other torpedo-boats (110 tons).
The additional submarines are Nos. 17, 21, 22, 27, 28, 29, 31, 32 (400 tons), 40, 41, 43, 47 (460 tons).

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Brazil.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Para	Yarrow ..	1908	240	23 6	10	2	550	7,014	27·25	2 4-in., 4 3 prs.	2	..	140
Amazonas		1908						6,898	27·17				
Piahuy		1908						6,563	27·21				
Matto Grosso		1908						7,403	27·16				
Parahyba		1909						6,700	27·29				
Rio Grande do N.		1909						7,778	27·27				
Alagoas		1909						7,403	27·25				
Santa Catharina		1909						6,982	27·30				
Parana		1910						8,877	28·74				
Sergipe		1909						8,554	27·60				
FIRST CLASS—													..
Goyaz	Yarrow ..	1907	152·5	15 3	..	3	..	..	26·5	2–3 prs.	2	..	..

Five additional destroyers and three large submarines are proposed.

Three submarines have been completed at Muggiano (F.I.A.T.), Medusa type improved (250–370 tons, 14-8·5 knots). A Special Laurenti submarine salvage and testing vessel, named Caera, 3800 tons, 328 ft. long, 50 ft. beam.

Chile.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Almirante Lynch, Condell	White	1912 1913	320	32·6	11·1	3	1850	27,000	31·7	6–4-in. 2 M.	3	..	507
Tome, Talcahuano	Laird	1898	238·8	27·9	9·8	—	750	4,500	20	3 3·8-in., 4–3-pr.	5	..	100
Capitan Orella ..	Laird	1896	210	21·6	5·4	2	300	6,000	30·17	1-12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Munoz Gamero	Laird	1896	210	21·6	5·4	2	300	6,000	30·42	1-12 pr. Q.F. 5–6 pr.	2	65	90
Teniente Serrano ..	Laird	1896	210	21·6	5.4	2	300	6,000	30·35	1–12 pr. Q.F.	2	65	90
Guardia-Marina Riquelme	Laird	1896	210	21·6	5·4	2	300	6,000	30·09	5 6 pr. 1-12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Merino Jarpa	Laird	1901	210	21·6	5·4	2	350	6,000	30	Do.	2	65	90
Capitan O'Brien ..													
Captain Thompson ..	Armstrong .	19.2	..	..	..	2	480	5,600	28	6-6 pr.	2	83	90
FIRST CLASS—													
Injeniero Hyatt, Cirujano Videla, Injeniero Mutilla, Guardia-Marina Contreras, and Teniente Rodriguez (Viper type) ..	Yarrow ..	1896 1898	152·6	15·3	7·9	1	140	2,200	27·5 27·2	3-3 pr. Q.F.	3	28	40

Four big destroyers or flotilla leaders (Lynch class) building at Cowes were taken over for the British Navy. Six submarines (Holland type) built for the British Government in 1915 were ceded to the Chilian Navy in 1917. They are numbered H 1 to H 6; 450–520 tons, 800 H.P., 15–18 knots, length 150 feet.

China.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Tung-An, Yu-Chang, Kien-Kon	Elbing ..	1912	158	20	7	..	400	6000	36·8	2 12-pr., 4 3-pr.	2	..	60
Chen, Suh	Stettin ..	1897	123·5	21·7	7	..	120	700	20	2 1-pr.	3	20	15
Hupeng, Huchung, Hujing, Hungo ..	Kobe	1906–7	100	20	6 5	..	97	950	23	2 3-pr.	3	37	..
SECOND CLASS—													
17 boats	Foochow ..	1903	88·6	6·7	3·3	1	30	550	20·5	..	..	..	..

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Denmark.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Nord Kaperen	Royal Dockyard, Copenhagen	1918											
Makreleu		1918											
Narhvalen		1917											
Havhesten, Sohunden		1917	126·3	13·9	8·9	1	108·5	2,000	24·6	2 2·2-in. A.A.	2	22	15·5
Sölöven, Stören		1916											
Springeren		1916											
Ormen		1907	124·6	13·9	8·5	1	105	2,100	26	2 1·5-in.	3	21	15
Sværdfisken		1913											
Delfinen, Hvalrossen		1913	148·2	16·9	7	2	190	3,480	26	1 2-in.	4	31	28·5
Söulven	Burmeister, Copenhagen	1911											
Feyvefisken		1911	181·7	18	6·3	2	275	5,000	27·5	2 3-in.	5	33	43
Soridderen	Yarrow & Co.	1911											
Spaekhuggeren	Royal Dock., Copenhagen												
Vindhunden		1911	184·8	19·1	7·1	2	300	5,000	27·5	2 3-in.	5	34	49
Tumleren	Schichau												
Söbjörnen	Royal Dockyard, Copenhagen	1898	147	15·5	7·7	1	140	2,100	23	1 1·8-in. 1 M.	4	24	16
Havörnen		1897											
Hajen		1896	145·4	15·1	8·1	1	140	2,100	23		4	24	16

Two torpedo boats of the Nord Kaperen type in hand.

SUBMARINES—Bellona, Rota, 301-369 tons, 1 2·2-in. A.A., 5 t.t. Galathea, Neptun, Triton, Rau, Ægir, 185-235 tons, 13·5-9·8 kts., 1 2·2 in. A.A., 3 t.t. Nymfen, Najaden, Havfruen, 164-204 tons, 13-9·3 kts., 2 M., 2 t.t.

One submersible of the Rota type and one of the Ægir type in hand.

France.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Arbalète	Normand	1903	184·9	20·11	8·9	2	372	7,136	31·58	1-9pr. 6-3prs.	2	62	75
Arc	Châlon	1902	184·9	20·11	10·5	2	313	6,600	28·74	1-9pr. 6-3prs.	2	62	75
Arquebuse	Normand	1902	191·0	20·11	10·6	2	370	7,000	30·76	1-9pr. 6-3prs.	2	62	75
Baliste	Rouen	1903	191·3	20·11	10·5	2	352	6,800	29·39	1-9pr. 6-3prs.	2	62	75
Bélier	Nantes	1903	185·0	20·11	11·0	2	358	6,953	..	1-9pr. 6-3prs.	2	62	75
Bombarde	Havre (F.&C.)	1903	191·0	21	10·7	2	321	6,500	30·46	1-9pr. 6-3prs.	2	62	75
Bouclier	Normand	1911	237·0	24·9	9·4	3	790	13,000	35·33	2-25-pr.4-9pr.	4	62	160
Carabine	Rochefort	1902	184·9	21	10·6	2	357	6,400	29·90	1-9pr. 6-3prs.	2	62	75
Carquois	Rochefort	1907	197·4	21·5	11·4	2	347	6,800	28·15	19-pr.6 3-prs.	2	62	37
Casque	Havre(F.&C.)	1910	246·4	25	10·0	3	820	14,400	34·90	1 25pr.,4-9pr.	4	62	160
Cavalier	Normand	1910	222·0	21·8	10·5	3	527	8,600	31·19	4–9 prs.	2	62	150
Chasseur	Normand	1909	222·0	21·8	10·0	3	492	9,000	30·39	4–9 prs.	2	62	120
Cimeterre	Bordeaux	1911	253·4	28·7	10·0	2	894	13,500	31·15	2-25pr.,4-9pr	4	62	160
Claymore	Normand	1906	196·8	21·6	11·4	2	3·9	7,600	30·45	1-9pr. 6-3prs.	2	62	75
Cognée	Toulon	1907	197·0	21·6	11·4	2	397	6,800	27·04	1-9pr. 6-3prs.	2	62	75
Coutelas	Rochefort	1907	197·4	21	10·0	2	351	7,000	29·07	1-9pr. 6-3prs.	2	62	75
Dard	Rouen	1903	185·0	20·8	10·8	2	360	6,800	29·58	1-9pr. 6-3prs.	2	62	84
Durandal	Normand	1899	180·4	21	7·9	2	308	5,600	27·42	1-9pr. 6-3prs.	2	62	75
Epée	Havre (F.&C.)	1900	185·8	21	9·0	2	313	5,600	26·19	1-9pr. 6-3prs.	2	62	75
Epieu	Normand	1903	191·0	21	10·4	2	320	7,300	31·24	1-9pr. 6-3prs.	2	62	75
Escopette	Rochefort	1900	183·9	20·9	8·9	2	311	5,200	26·50	1-9pr. 6-3prs.	2	..	..
Fanion	Bordeaux	1908	197·0	21·7	11·5	2	360	6,800	29·06	1-9pr. 6-3prs.	2	62	84
Fanfare	Normand	1907	197.0	21·7	11·5	2	361	6,600	28·0	1-9pr. 6-3prs.	2	..	..
Fauconneau	Normand	1900	183·9	20·8	3·9	2	311	5,600	27·14	1-9pr. 6-3prs.	2	62	75
Flamberge	Rochefort	1901	189·0	20 8	10·5	2	318	5,200	26·80	1-9pr. 6-3prs.	2	62	75
Fleuret	Rochefort	1906	197·4	21·5	11·4	2	350	6,300	29·0	1-9pr. 6-3prs.	2	62	75
Francisque	Rochefort	1904	191·0	21	10·6	2	310	6,500	30.06	1-9pr. 6-3prs.	2	62	65
Fronde	Bordeaux	1902	191·0	21	10·6	2	307	6,600	30·78	1-9pr. 6-3prs.	2	..	..
Gabion	Rouen	1907	196·4	21·7	11·5	2	350	6,400	29·77	1-9pr. 6-3prs.	2	62	75
Glaive	Rochefort	1908	197·4	22·4	11 8	2	358	6,800	27·90	1-9pr. 6-3prs.	2	62	75
Hache	Toulon	1908	197·2	21·5	11·4	2	359	6,800	26·48	1-9pr. 6-3prs.	2	62	84
Hallebarde	Normand	1899	180·5	20·8	7·11	2	308	5,000	27·20	1-9pr. 6-3prs.	2	62	75
Harpon	Bordeaux	1902	191·0	21	10·6	2	314	6,600	30·7	1 9pr. 6-3prs.	3	62	120
Hussard	Lorient	1908	216·0	22·8	10·0	2	407	7,750	30·0	6–9 prs.	3	62	150
Janissaire	Rouen	1910	223·0	21·9	10·3	3	514	7,650	28·5	6-9 prs.	2	62	75
Javeline	Nantes	1902	183·9	20·11	9 0	2	307	6,600	28·4	1-9pr. 6 3prs.	3	62	150
Lansquenet	Bordeaux	1909	221·2	20·8	10·0	3	542	8,129	28·8	6–9 prs.	3	62	150
Mameluck	Nantes	1909	216·0	22·8	10·0	2	407	7,750	30·5	6–9 prs.	2	62	75
Massue	Toulon	1908	197·2	21·7	11·4	2	350	7,128	28·4	1-9pr. 6-3prs.	2	62	75
Mortier	Rochefort	1906	197·4	21·5	11·3	2	347	6,800	29·5	1-9pr. 6-3prs.	2	62	75
Mousqueton	Châlon	1903	185	21	10·5	2	314	6,600	28·5	1-9pr. 6-3prs.			

N.B.—F. & C., Forges et Chantiers. Normand means that the boat has been built at that firm's yard at Havre.

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France—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement	Fuel Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—*cont.*													
Obusier	Rochefort	1906	185	21·5	11·2	2	314	6,800	28 3	1-9pr. 6-3prs.	2	62	75
Oriflamme	Nantes	1908	197	21·7	11·6	2	366	7,2?6	29·5	1-9pr. 6-3prs.	3	..	..
Pertuisane	Rochefort	1900	184	20·9	8·9	2	311	5,000	27	1-9pr. 6-3prs.	2	62	75
Pierrier	Rochefort	1907	197	21·5	11	2	332	6,800	27·1	1-9pr. 6-3prs.	2	62	75
Pique	Havre (F.&C.)	1900	186	21	8·9	2	313	5,600	25·5	1-9pr. 6-3prs.	2	62	75
Pistolet	Nantes	1903	185·8	21	11	2	356	6,554	28·9	1-9pr. 6-3prs.	2	62	75
Poignard	Rochefort	1909	197	22	11	2	358	6,800	28	1-9pr. 6 3prs.	2	62	75
Rapière	Rochefort	1901	189	21	10·5	2	317	5,200	26 8	1-9pr. 6-3prs.	2	62	75
Sabre	Rochefort	1904	191	21	10·5	2	312	6,500	29·7	1-9pr. 6-3prs.	2	62	75
Sabretache	Nantes	1908	197	21·7	11·6	2	366	7,000	29·6	1-9pr. 6-3prs.	3	..	..
Sagaie	Havre (F.&C.)	1902	191	21	11	2	368	7,300	30·4	1-9pr. 6-3prs.	2	62	75
Sape	Rouen	1907	196·8	21·7	11·5	2	350	6,400	30	1-9pr. 6-3prs.	3	..	..
Sarbacane	Rochefort	1903	185	21	10·5	2	365	6,400	29·5	1-9pr 6-3prs.	2	62	75
Spahi	Havre	1908	224	21·7	10	2	455	9,000	29·4	6-9 prs.	3	62	120
Stylet	Rochefort	1905	197·3	21·5	11	2	343	5,800	27	1-9pr. 6-3prs.	2	62	75
Takou*	Elbing	1898	193·7	21·0	..	2	280	6,000	25	1-9pr. 6-3prs	2	62	67
Trailleur	Bordeaux	1908	207	22·8	9·6	3	479	7,800	27·3	6-9 pr.	2	62	120
Tromblon	Rochefort	1905	197·3	21 5	11	2	344	5,800	28·4	1-9pr. 6-3prs.	3	62	67
Trident	Rochefort	1907	197·3	21·5	11	2	347	6,800	28·1	1-9pr. 6-3prs.	2	62	37
Voltigeur	Nantes	1909	215	22·9	10	3	594	8,500	31·3	6-9 prs.	3	62	120
Bory, Garnier, Rivière, Mehl, Dehorter (5)	Normand, &c.	1912	253·6	25·4	10·0	3	780	14,100	31	{2 3·9-in., 4 9 prs.	4	81	120
Bisson													
Protet, Magon, Comm. Lucas, Mangini (5) ..	Toulon, etc.	1912 & 1913	274	26	10·0	3	800	15,000	31	{2 3·9-in., 4 9 prs.	2 dbl.	81	120
Henry, Herbert (2)	Rochefort ..	1911 & 1912	221	21·6	10·3	2	475	7,500	29·5	6-9 prs.	4	62	50
Roux, Lestin, Gabolde (3)	Rochefort & Normand	1914–1915	271	26·9	10·0	2	880	20,000	31	{2 3·9-in., 4 9 prs.	3 dbl.	81	..
TORPILLEURS D'ESCADRE—													
Annamite													
Algérien													
Arab													
Bambara													
Hova													
Kabyle													
Marocain	Japan	1917	272	24	7·10	..	685	10,000	29	{1–4·9 in., 4–12 prs.	2 dbl.	..	..
Sakalave													
Sénégalais													
Somali													
Tonkinois													
Touareg													
SEA-GOING—													
Audacieux	Nantes	1900	144·2	15·2	10	2	185	4,200	26·1	2–3 prs.	3	..	18
Borée	Bordeaux	1901	152	17	8	2	178	3,900	29·5	2–3 prs.	2	..	18
Bourrasque	Normand	1901	147·7	16	8	2	160	4,400	31·4	2–3 prs.	2	..	18
Cyclone	Normand	1898	144·2	15·2	10	2	152	4,200	30·3	2–3 prs.	2	..	18
Forban	Normand	1895	144·2	15·2	10	2	152	3,200	31·3	2–1 prs.	2	..	..
Grondeur	Havre (F.&C.)	1892	147·5	14·5	8	2	130	1,750	23·8	2–3 prs.	2	27	20
Mistral	Normand	1901	153	17	8·8	2	186	4,018	28·2	2–3 prs.	3	..	23
Rafale	Normand	1901	147·7	17	8	2	167	4,400	31·1	2–3 prs.	2	..	18
Simoun	Havre (F.&C.)	1901	152·7	17	9	2	186	4,600	27·7	2–3 prs.	3	..	18
Siroco	Normand	1901	152·7	17	9	2	186	4,300	28·7	2–3 prs.	3	..	23
Tramontane	Bordeaux	1901	152·7	17	9	2	162	3,900	29 8	2–3 prs.	2	..	18
Trombe	Nantes	1900	147 8	17	8 8	2	185	4,200	26	2–3 prs.	3	..	18
Typhon	Havre (F.&C.)	1901	152·7	17	8	2	186	4,600	27 7	2–3 prs.	3	..	18
FIRST CLASS—													
216–226 (11 boats)	Cherbourg, Toulon, etc.	1899–1902	121·6	13·6	8·6	1	86	1,500	23·5	2–1 prs.	2	23	10
227–235 (8 boats)	Bordeaux, etc.	1899	117	13·2	8·7	1	86	1,500	23·5	2–1 prs.	2	23	10
236–255 (19 boats) ..	Bordeaux, etc.	1902	121·4	13·2	8·7	1	90	1,500	23·5	2–1 prs.	2	23	10
256–257 (2 boats)	Bordeaux, etc.	1900	124·8	13·2	8·7	1	97	2,000	26·0	2–1 prs.	3	24	10
258–261 (4 boats)	Bordeaux	1902	124·8	13·2	8·7	1	97	2,000	26·0	2–1 prs.	3	24	10
262 (1 boat)	Creusot	1902	124·8	13·2	8·7	1	97	2,000	26·0	2–1 prs.	3	24	10
264–265 (2 boats)	Bordeaux	1902	124·8	13·2	8·7	1	97	2,000	26·0	2–1 prs.	3	24	10
266–276 (11 boats) ..	Bordeaux etc.	1902	124·8	13·2	9·6	1	97	2,000	26·0	2–1 prs.	3	24	10
277–294 (18 boats) ..	Bordeaux, etc.	1904	124·8	14·0	9·6	1	97	2,000	26·0	2–1 prs.	3	26	10
295–317 (21 boats)‡ ..	Normand, etc.	1905											
318–367 (40 boats)† ..	Havre, etc.	1905–7	131	14·0	9·6	1	101	2,000	26	2–1 prs	3	26	10
368–369 (2 boats) ..	Toulon ..	1906											

* Captured from the Chinese at Taku, 1900.

† Nos. 300, 317, 319, 331, 333, 347 and 318 have been lost in the war.

‡ Nos. 390 and 317 lost from this series.

During the war the following destroyers were lost:—Mousquet, Dague, Branlebas, Renaudin, Fantasein, Fourche, Yatagan, Etendard, Boutefeu and Catapulte; also 7 torpedo boats.

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France—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.
			Length.	Beam.	Draught.							
			Feet.	Feet.	Feet.		Tons.		Knots.			
SUBMARINES—												
Aigrette	Toulon	1904	127·6	12·9	8·3	1	180	200	10·5	..	4	20
Algérien	Cherbourg	1901	121	9·2	9·2	1	146	250	8–13	..	3	9
Alose	Toulon	1904	78	7·6	8·0	1	70	60	8	..	2	5
Anguille	Toulon	1904	78	7·6	8·0	1	70	60	8	..	2	5
Bonite	Toulon	1904	78	7·6	8·0	1	70	60	8	..	2	5
Castor	Rochefort	1903	78	7·6	8·0	1	70	60	8	..	2	5
Cigogne	Toulon	1904	118·10	12·9	8·3	1	172	200	10·5	..	4	20
Dorade	Toulon	1904	78	7·6	8·0	1	70	60	8	..	2	5
Emeraude	Cherbourg	1906	151	12·9	12·0	2	390	600	12	..	4	16
Espadon	Cherbourg	1901	108 9	12·0	8·6	2	106–200	250	8–12	..	2	10
Esturgeon	Toulon	1903	77	7·6	8·0	1	68	60	8	..	..	5
Français	Cherbourg	1900	120·9	9·0	9·5	1	146	250	8–13	..	3	9
Grondin	Toulon	1903	77	7·6	8·0	1	68	60	8	..	..	5
Korrigan	Rochefort	1901	135·8	9·5	9·5	1	185	..	8–12¼	..	..	9
Loutre	Rochefort	1903	78	7·6	8·0	1	70	60	8	..	2	5
Ludion	Cherbourg	1904	79	7·6	8·0	1	70	60	8	..	2	5
Lynx	Cherbourg	1903	78	7·6	8·0	1	70	60	8	..	..	5
Méduse	Rochefort	1904	78	7·6	8·0	1	70	60	8	..	2	5
Naïade	Cherbourg	1902	78	7·6	8·0	1	70	60	8	..	2	5
Opale	Cherbourg	1906	151	12·9	12·0	2	390	600	12	..	4	..
Otarie	Rochefort	1904	78	7·6	8·0	1	70	60	8	..	2	5
Oursin	Rochefort	1904	78	7·6	8·0	1	70	60	8	..	2	5
Phoque	Rochefort	1904	78	7·6	8·0	1	70	60	8	..	2	5
Protée	Cherbourg	1903	78	7·6	8·0	1	70	60	8	..	2	5
Rubis	Cherbourg	1907	151	12·9	12·0	2	390	600	12	..	4	16
Silure	Cherbourg	1901	111·6	12·4	5·4	1	157	250	8–12	..	4	10
Sirène	Cherbourg	1901	111·6	12·4	5·4	1	156	250	8–12	..	4	10
Souffleur	Toulon	1903	78	7·6	8·0	1	70	60	8	..	2	5
Thon	Toulon	1904	78	7·6	8·0	1	70	60	8	..	2	5
Topaze	Cherbourg	1908	144	12·9	12·0	2	390	600	12	..	4	..
Triton	Cherbourg	1901	105·8	12·4	8·4	1	156	250	8–12	..	4	10
Truite	Toulon	1905	78	7·6	8·0	1	70	60	8	..	2	5
Dauphin	Cherbourg	1904	124	10·2	7·6	2	168	220	10¼	..	4	..
Argonaute	Toulon	1905	160·6	13·9	9.0	1	305	330	11	..	6	20
Pluviôse, Ventôse, Nivôse, Germinal, Messidor, Thermidor, Fructidor, Brumaire, Frimaire	Cherbourg	1907 to 1912	170.8	18·0	10·3	2	398	700	9¼–12¼	..	7	24
Papin, Berthelot	Rochefort	1909	166.4	16·4	13·6	2	408	700	7¾–12¼	..	6	24
Ampère, Gay-Lussac	Toulon	1908 & 1909	166·4	16·4	13·6	2	398	700	7¾–12¼	..	6	24
Euler, Franklin, Watt, Cugnot, Giffard, Faraday, Volta, Newton, Montgolfier Coulomb, Arago, Le Verrier,	Cherbourg / Rochefort / Toulon	1909 1912	160	16·4	13·6	2	398	340	7¾–12¼	..	7	24
Amiral Bourgeois	Cherbourg	1912	184·6	18·2	..	2	555–735	1,560	10–15	..	7	25
Archimède	Cherbourg	1909	200	18·2	..	2	577–810	1,700	10–15	..	7	27
Clorinde, Cornélie, Amphitrite, Astrée, Artémis, Aréthuse, Atalante, Amaranthe, Andromaque	Rochefort	1913 & Bldg.	174	16 9	10·9	2	410	1,300	15·8	..	8	20
Gustave Zédé / Néréide	Cherbourg	1913	243	19·8	14·4	2	787–1000	4,800	10–20	..	8	40
Bellone, Hermione, Gorgone	Rochefort / Toulon	1914 & 1915	198·9	17·7	11·9	2	520	1,800	17	..	8	29
Dupuy de Lôme, Sané	Toulon / Toulon	1915 1916	2.7	21·0	13·0	2	830	4,400	18·0	1-75mm., 1M.	8	..
Daphne	Cherbourg	1915	223	18·0	12·0	2	633	1,800	15·1	,, ,,	10	..
Joessel	Cherbourg	1917	243	20·0	13·4	2	850	..	16·8	2-75mm., 1M.	10	..
Fulton	Cherbourg	1917										
Laplace	Rochefort	1917										
Lagrange, Regnault	Toulon	1917	247	21·0	13·0	2	840	..	16·5	,, ,,	10	..
Romazzotti	Toulon	1918										
Amazone / Armide / Antigone	Schneider	1918	184·6	17·0	10·6	2	665-467	2,000	17·5	1-2 pr., 1.M.	6	..

Additional submarine, Roland Moullot (ex U.B. 26). Twenty-seven of the German submarines surrendered at Harwich were handed over to France.

During the war the following submarines were lost:—Curie, Saphir, Joule, Mariotte, Fresnel, Monge, Foucault, Ariane, Bernouilli, Diane, Floréal, Prairial and Circé.

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The Surrendered German Flotillas.

DESTROYERS.—With the exception of the Taku, captured at the taking of the Taku forts in 1900, and eight older divisional boats, built by Messrs. Thornycroft (1887–98), all German destroyers had been constructed in German yards. They bore numbers and letters to indicate where they had been built—G, Germania, Kiel; V, Vulcan, Stettin; and S, Schichau, Danzig. Twelve were built yearly, and in 1911–12 a new numerical series was introduced beginning with V 1.

After the outbreak of war, in order to avoid confusion, all the boats anterior to V 1 received the new distinguishing letter T in substitution for the letters they had previously borne. Other shipbuilders began to construct torpedo craft, and new letters appeared in the numerical series—B, Blohm & Voss, Hamburg (builders of the battle-cruisers); H, Howaldt, Kiel; and WW, Weser, Bremen. The numerical series appears to have reached G 147 in the construction list of 1917–18. Most of these destroyers displaced 750 tons, with a speed of 34 knots. Some of them were armed with three 22-prs., and others with three 4·1-in., and most of them had six tubes for 19·7-in. torpedoes. When B 97 & 98 were built, bigger destroyers were put in hand, the displacement being 1256 and 1300 tons, and the main armament was of two or three 4·1-in. guns. The later destroyers reverted to the lesser displacement (750 tons) and they carried three 4·1-in. guns and were fitted with six tubes.

A great number of the destroyers were sunk, blown up, or otherwise destroyed in the war—ten early in the hostilities, ten in 1915, sixteen in 1916 (including V 4, 27, 29 and 48, and S 35 in the Jutland battle), eleven in 1917, and twenty-two in 1918 (including five sunk in Flanders on July 7th). The total loss therefore was sixty-nine.

TORPEDO-BOATS.—The torpedo-boats included ten divisional boats, four 318-ton boats which were being constructed for Holland in the Vulcan yard in 1914 and were taken over, 113 first-class boats and twenty two smaller. The total loss in these classes was fifty-three.

SUBMARINES.—The German submarines were of four classes:—

The U-boats included the ocean-going type represented by U 160–164, 800–1000 tons, one 4·1-in., one 22-pr., one machine gun and 6 tubes; the converted mercantile type, 19, including the Deutschland (U 155); and the cruiser type, to which belonged the series U 135–141, built at Danzig (1850–1900 tons, two 5·9-in. and two machine guns and six tubes). Exclusive of the largest types the U Boats ranged from 750 to 1000 tons.

The U B-Boats were described as for coast purposes, 250–290 tons and larger, built mostly by Blohm & Voss and the Weser yard. As the war progressed they were used in increasing numbers, mostly in the waters surrounding the British Isles and the approaches to the Channel, but also in the Mediterranean.

The U C-Boats, of which class there were about 36, were the mining submarines. They carried from twelve to eighteen mines, and the later vessels mounted a 22-pr. or 4·1-in. gun.

The U R-Boats—there were only about three of this class—were designed for harbour defence.

The figures which follow show the destruction of the German submarines, and are peculiarly significant. They indicate the progressively intensifying character of the anti-submarine campaign, and suggest the remarkable success with which the submarines were defeated.

1914	Submarines destroyed	.. ..	5
1915	,, ,,	.. ..	19
1916	,, ,,	.. ..	25
1917	,, ,,	.. ..	66
1918	,, ,,	.. ..	85
			200

The total number surrendered was 159, the last boat brought in being U B 136.

These figures are believed to be accurate, and if there should be any error it cannot effect more than five or six of the German submarines destroyed. One of the boats, U 97, sank in the North Sea when on her way to surrender. The boats destroyed in 1914 were all of the U class; in 1915 the U B and U C classes began to appear, and in the subsequent years all classes were represented except the harbour class.

Greece.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Nafkratousa .. Thyella .. .. .. Sphendoni .. .. Lonchi	Yarrow ..	1906	220	20·6	7·2	2	350	..	32·1 31·79 31·84 32·53	2 12, 4 6-pr.	2	58	80
Nike.. .. .. .. Aspis .. .. .. Velos	Stettin (Vulcan)	1906	220	20·6	7·2	2	350	..	30	2 12, 4 6-pr.	2	58	80
Aetos, Leon, Panthir, Jerax ..	Birkenhead	1911	285	29·9	9·6	..	980	19,750	32	4 4-in.	4	110	225
Keravnos .. .. .. Nea Genea	Stettin ..	1911	..	..	..	..	750	..	32·5	4 3·4-in.	2	..	..
SUBMARINES—													
Delphin, Xiphias ..	Chalon sur Saône ..	1911–12	164	..	..	..	(300–460)	..	14·9	..	5	..	..

The destroyer Doxa was torpedoed and sunk, 1917.

Six 125-ton torpedo-boats built by the Vulcan Co. at Stettin: Arethusa, Doris, Aigli, Dafni, Alcyon, Thetis.

Two Laubeuf type submarines building at the Schneider works, Le Creusot, were taken over for the French Navy.

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Italy.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Fulmine	Sestri (Odero)	1898	200	20·4	5·4	2	298	4,800	28	5 6-pr. Q.F.	2	43	60
Lampo													
Freccia													
Dardo	Elbing (Schichau)	1899 1901	196·8	21·3	5·8	2	320	6,000	30	1 14-pr. Q.F., 5 6-pr.	2	53	60
Strale													
Euro													
Ostro													
Aquilone													
Borea	Naples (Pattison)	1901 1902	210	19·4	7 6	2	330	6,000	30	5 6-pr. Q.F.	2	53	60
Meteoro													
Tuono													
Zeffiro	Naples (Pattison)	1904	210	19·4	7·6	2	330	6,000	30	5 6-pr. Q.F.	2	53	60
Espero													
Bersagliere													
Artigliere		1906 1907											
Granatiere													
Lanciere													
Alpino	Genoa (Ansaldo)		211·6	20·0	7·6	3	365	6,000	30	4 14-pdr.	3	55	82
Corazziere													
Pontiere													
Carabinieri		1909 1910											
Fucilieri													
Impavido													
Indomito	Naples (Pattison)	1912 & 1913	246	24·6	7·6	..	650	15,000	35·2	1 4·7 in. 4 14-pr.	2	..	100
Insidioso													
Irriquieto													
Ardito	Orlando (Leghorn)	1912 & 1913	246	24·6	7·6	..	650	15,000	35·5	1 4·7 in. 4 14-pr.	2	..	..
Ardente													
Animoso													
Ascaro	Ansaldo ..	1912	211·5	20·0	6·6	..	380	6,000	29	2 14-pr. 4 6-pr.	3	..	80
Francesco Nullo ..													
Antonio Mosto ..	Naples (Pattison)												
Guiseppe Sirtori ..													
Giacinto Carini ..													
Rosolino Pilo		1913 & 1914	238	24	8·9	..	770	18,000	33	4 4-in., 2 14-pr., 2 M. Carry also 10 mines	2 dbl.	100	170
Guiseppe Abba ..													
Simone Schiaffino ..	Genoa (Odero)												
Pilade Bronzetti ..													
Guiseppe Missori ..													
Ippolito Nievo													
Francesco Stocio ..													
Giovanni Acerbi ..													
Vincenso Orsini ..		1913 & 1914	238	24	8·9	..	170	18,000	33	4 4-in., 2 14-pr., 2 M. Carry also 10 mines	2 dbl.	10	170
Guiseppe la Maza .	..												
Angelo Bascini ..													
Nicola Fabrizi ..													
Giacomo Medici ..													
Audace	Yarrow ..	1918	..	..	..	..	1085	21,500	30	7 4-in., 2 2-pr., A.A.	4 dbl.	111	240
FIRST CLASS—													
Pellicano	Sestri (Odero)	1899	157·4	15	14·8	2	147	2,700	25	2 3-pr.	2	28	24
Condore	Sestri(Ansaldo)	1898	154·3	16·8	6·9	2	136	2,500	27	2 3-pr.	2	27	16
Sirio, Sagittario ..	Elbing .	1905–6											
Spica, Scorpione ..		1905 6											
Serpente, Saffo ..		1905–6											
Alcione, Ardea ..													
Albatros, Aiorone ..	Odero	1905 1906	164	19·6	6 3	2	215	2,900 3,250	25	2 3-pr.	2	..	40
Astore, Arpia													
Orione, Orsa	Genoa (Ansaldo)	1905 1906											
Olympia, Orfeo ..													
Gabbiano	Spezia	1907											
Pegaso	Naples (Pattison)	1905											
Perseo		1905											
Procione		1905											
Pallade													
Cigno													
Cassiopea	Naples (Pattison)	1906	164	17·4	7·0	2	200	3,000	25·4 26·6	3 3-pr.	3	..	40
Calliope		1907											
Clio		1906											
Centauro		1907											
Canopo		1907											
Calipso	Naples (Pattison)	1909											
Climene		1909											
1 P.N.–12 P.N.* ..	Pattison ..												
13 O.S.–24 O.S.† ..	Odero	1912 & 1913	139	13·9	..	..	130	2,500	27	1 6-pr.	2	..	..
25 A.S.–32 A.S. ..	Ansaldo ..												
33 P.N.–38 P.N. ..	Pattison ..												
39 R.M. 40 R.M. ..	Spezia	1914											

For flotilla leaders used as scouts see cruiser list. Also Arno, 600 tons, 30 knots (built for Portugal), and four of 1450 tons, 35 knots, three 4·7-in., seven 12-pr. (for Roumania), and taken over. Ten destroyers projected and building.

* 5 P.N. lost from this series. † O.S. 17 lost from this series.

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Italy—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
SUBMARINES—													
Delfino	Spezia	1894	78·6	10·1	..	1	111	150	10–12	..	2	12	..
Glauco, Squalo, Narvalo, Otaria, Tricheco	Venice, &c.	1906 / 1907 / 1909	120	14·3	..	..	180 / 230	..	15	..	2	..	..
Foca, Argo Fantina, Salpa Fisalia, Zoea	Muggiano / F.I.A.T. / S. Giorgio	1908 to 1913	148	13·9	..	..	225 / 320	750	14·6 / 8·5	..	2	..	..
Nautilus	Venice	Bldg.	134·6	14·2	..	..	221 / 297	600	19·5	..	3	..	..
G. Ferraris	Spezia	1912	134·6	14·9	..	..	345 / 400	1200	15–9	..	4	17	..
Atropo	Kiel (Germania)	1912	146	14·6	..	..	330	700 / 400	12½ / 8½	..	2	..	..
Galvani, Torricelli, P. Micca L. Mocenigo L. Marcello A. Zeno A. Pacinotti A. Barbarigo A. Provana S. Veniero G. Nani	Spezia Venice Spezia, F.I.A.T. Spezia, F.I.A.T.	1915 1918	..	..	..	..	700 / 1000	2600	16 10	2 14-pr. A.A.	5	..	..
X 1, 2, 3	Ansaldo	1915 1918	..	..	..	..	179 / 200	80 / 202	7 5	..	..	..	..
H 1 to 4, 6 to 8	Vickers		..	..	..	..	..	400 / 480	13–11	..	..	22	14
W 1, 2, 3	Armstrong		..	..	..	..	500	710 / 480	13 8·5	1 3-in. A.A.	..	18	..
F 1 to 21	F.I.A.T. Odero Orlando		..	..	..	..	260 / 380	600 / 450	13·8·5	1 3-in. A.A.	2	..	12
B 1, 2, 3	Spezia		..	..	..	..	..	..	..	..	..	..	..
A 1 to 6	..		..	..	..	..	..	..	..	..	..	..	..
S 1, 2, 3	Greenock		..	..	..	..	252 / 386	600 / 400	13·8·5	..	2	..	10

Eight submarines projected. The German submarines V 12 and U C 12 were captured and added to the Italian Navy.

Japan.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Murakumo Shinonome	Thornycroft Thornycroft	1898 1898											
Yugiri Shiranui Kagerou Usugumo	Thornycroft Thornycroft Thornycroft Thornycroft	1898 1899 1899 1900	210·0	19·5	7·2	2	307	5,800	30 to 31	1 12-pr., 5 6-prs.	2	54	80
Shirakumo Asashio	Thornycroft Thornycroft	1901 1902	216·7	20·7	8·3	2	373	7,400	31	1 12-pr., 5 6-prs.	2	59	96
Akebono Sazanami	Yarrow Yarrow	1899 1899	220·0	20·6	9·6	2	311	6,000	31	1 12-pr., 5 6-prs.	2	55	95
Oboro	Yarrow	1899	220·3	20·6	9·6	2	311	6,000	31·62	1 12-pr., 5 6-prs.	2	..	90
Niji	Yarrow	1899	220·3	20.6	9·6	2	308	6,000	31·15	1 12-pr., 5 6-prs.	2	..	90
Kasumi	Yarrow	1902	220·3	20·6	9·6	2	335	6,000	31	1 12-pr., 5 6-prs.	2	..	..
Asagiri Murasame	Yokosuka Yokosuka	1902 1902	220·3	20·6	9·6	2	374	6,000	29	1 12-pr., 5 6-prs.	2	..	..
Yamabiko Fumizuki Satsuki	Port Arthur Port Arthur Petrograd	1903 1903 1902	196·9	18·4	11·5	2	250	6,000	27	1 12-pr., 5 3-prs.	2	..	80
Hatsushima Yayoi Kisaragi Hibiki Wakaba Hatsuyuki Kamikaze Ariake	Yokosuka Yokosuka Yokosuka Yokosuka Yokosuka Yokosuka Yokosuka Yokosuka	1905 1905 1905 1906 1905 1906 1905 1905	220·3	20·6	9·6	2	374	6,000	29	6 12-pr.	2	..	..

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Japan—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—*contd.*			Feet.	Feet	Feet		Tons.		Knots.				Tons.
Fubuki	Yokosuka	1905											
Arare	Yokosuka	1905											
Yunagi	Maizuru	1906											
Oite	Maizuru	1905											
Asakase	Kobe	1905											
Harukase	Kobe	1905											
Shigure	Kobe	1906											
Hatsuharu	Kobe	1906	220·3	20·6	9·6	2	374	6,000	29	6 12-pr.	2	..	..
Yuguri	Sasebo	1905											
Yudachi	Sasebo	1906											
Mikadzuki	Sasebo	1906											
Nowake	Sasebo	1906											
Uschio	Kure	1905											
Nenohi	Kure	1905											
Shiratsuyu	Nagasaki	1906											
Shirayuki	Nagasaki	1906											
Matsukase	Nagasaki	1906											
Asatsuyu	Osaka	1907											
Hayakase	Osaka	1906											
Kikutsuki	Uraga	Bldg.											
Minatsuki	Uraga	Bldg.	220·3	20·6	9·6	2	374	6,000	29	6 12-prs.	2	70	90
Nagatsuki	Uraga	1907											
Utsuki	Uraga	1907											
Isonami	Yokosuka	1909											
Uranami	Yokosuka	1909											
Ajanami	Yokosuka	1909											
Kaifu	Maizuru	1909											
Umikaze	Nagasaki	1910	..	..	..	..	1200	20,500	35	2 4·7-in., 5 3-in.	3	123	..
Yamakase	..	1911											
Sakura	Kure	1912											
Tashibana	Kure	1912	..	..	..	..	600	18,000	33	1 4·7-in., 4 12-pr.	4	..	..
Tanikase	Maizuru												
Minekase	Maizuru												
Sawakase	Mitzubishi												
Okikase	Maizuru												
Shimakase	Maizuru												
Nadakase	Maizuru												
Yakase	Maizuru												
Hakase	Maizuru	1916–17	320	29	9·5	..	1300	28,000	34	3 4·7-in., 2 M.	6	..	..
Momo	Maizuru	1918–19											
Kaya	Maizuru												
Nore	Maizuru												
Kure	Maizuru												
Nashi	Maizuru												
Taka	Maizuru												
Kaki	Maizuru												
Tsuga	Maizuru												
FIRST CLASS—													
Hayabusa	Normand	1898											
Kasasagi	Normand	1899											
Manadzuru	Normand	1899	147·7	16·0	8·2	2	150	4,200	30	1 6-pr., 2 3-prs.	3	26	30
Chidori	Normand	1900											
Shiratuka	Elbing	1899											
Aotaka	Kure	1903											
Hato	Kure	1903											
Hibari	Kure	1903											
Kari	Kure	1903											
Kiji	Kure	1903											
Tsubame	Kure	1903	147·7	16·0	8·2	2	150	4,200	27	1 6-pr., 2 3-prs.	3	26	30
Hashitaka	Kawasaki	1902											
Kimone	Kure	1904											
Otori	Kawasaki	1904											
Sagi	Kure	1902											
Uzuri	Kure	1902											
SECOND CLASS—													
2 boats	Kobe	1901	..	..	..	..	83	..	..	..	..	..	..
10 boats	Yarrow	1900	152·6	15·3	7·9	..	..	1,900	27	2 3-prs.	3	..	36
16 boats	Elbing	1891–9	..	..	..	..	..	..	..	..	..	..	..
1 boat (No. 24)	Normand	1891	118	13·1	6·9	1	80	1,200	23	2 1-prs.	2	21	10
2 boats	Normand	1898	121·4	13·6	8·6	1	86	1,800	27	1 3-pr.	2	..	10
SUBMARINES—	[U.S.A.												
5 boats	Fore River,	1904–5	65	12	..	..	120	..	9½–8	..	1	..	..
2 boats	Japan	1906	..	..	..	..	60·80	..	9 7	..	1	..	..
2 boats	Vickers	1908	135	13·5	..	..	325	..	14	..	2	..	..
4 boats	Kawasaki	1911 & 1914	..	..	..	..	..	..	..	..	..	..	..

Destroyers, Amatsukase, Isokase, Hamakase, were launched at Kure in 1915 (Umikaze class). Destroyers Kaba, Kaede, Kashiwa, Katsura, Kiri, Kusu, Matsu, Sakaki, Sugi, Ume (1913 programme), Yanagi, Kashi, Hinoki (1914) built in Japan (Sakura class, 600 tons). Destroyers Shirotaye and Tokitsukase and torpedo-boat No. 33 lost in the war. There are thirteen submarines added to those named above.

In 1917 the construction of Laurenti type submarines, 1070 tons, 246 feet long, and able to travel 6000 miles, was begun at the yard of the Kawasaki company.

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Portugal.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS:			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Tejo	Lisbon	1901	..	..	..	..	520	7000	25·5	1 4-in., 5 M.	2	..	..
Douro	Lisbon	1913											
Guadiana	Lisbon	1914											
Vouga	Lisbon	1915	240	23·6	7·9	3	700	11,000	29	1 4-in., 2 12 pr.	2	..	..
Tamega	Lisbon	1915											

The Vouga and Tamega are completing and will have Yarrow boilers and turbines. There are four obsolete torpedo-boats and three have been built in France. Submarine Espadarte, 245-300 tons, 13 knots, built at the F.I.A.T.-San Giorgio Yard, Muggiano; three others, Foca, Golfinho and Hidra (Laurenti type) are in service.

Netherlands.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Wolf, Fret (1909) .. Bulhond, Jakhals (1910) Hermelijn, Lynx, Panter, Vos (1911)	Flushing ..	1910–1913	230	20·6	9	2	510	7,500	30	4 2·9-in., 4 M.	2	84	100
FIRST CLASS—													
Hydra, ...	Yarrow ..	1900	130	13·6	6·0	1	77	1,200	24·4	2 1·5-in.	3	18	20
Ophir	Yarrow ..	1901	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Pangrango	Yarrow ..	1901	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Rindjani	Yarrow ..	1901	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Smeroe	Fijenoord ..	1904	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Tangka	Fijenoord ..	1904	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Wajang	Fijenoord ..	1904	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Minotaurus, Python Zeeslang .. .. .. Krokodil .. .. .. Draak .. .. .. Sfinx .. .. .. Scylla	Flushing ..	1904	152·6	15·3	7·9	1	130	1,900	27	2 2-in.	2	25	36
Scylla	Flushing ..	1905	152·6	15·3	7·9	1	130	1,900	27	2 1-5in.	2	25	36
G 1 .. .. G 2 .. .. G 3 .. .. G 4	Flushing, Rotterdam, & Fijenoord	1904	154·3	16·5	7·9	1	144	2,000	25	2 2-in.	3	24	40
G 5 .. .. G 6 .. .. G 7 .. .. G 8 .. .. G 9-10-12	Do. ..	1906	154·3	16·5	7·9	1	144	2,000	26	2 2 in.	3	24	40
G 13-16	Scheldt .. Fijenoord ..	1914	165	17·3	9·5	1	188	2,000	26	2 3-in.	3	27	..
Z 5-8	Do.	1915	197	20	9·7	2	310	5,500	27	2 2-in.	4	39	60
Z 1-4	Amsterdam	Bldg.	..	..	..	..	322	..	..	..	..	..	..

The Yarrow destroyers have Yarrow water-tube boilers, and the later ones are fitted for the consumption of oil fuel. SUBMARINES.—O 1 to O 8 and M 1 (Submarine mine-layer) are for the Netherlands Home Navy. Submarine depôt ships, Vali and Cornelis Drebbel. K 1 to K 10 are submarines for the Indian Navy. Nos. 2–10 are building in Holland. A depôt ship for the Indian submarines is building in Amsterdam.

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Norway.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Valkyrien	Elbing	1896	190	24·3	9·3	2	374	3,300	23·2	4 12-pdrs.	2	59	90
Draug, Troll, Garm	Horten	1908, 1909, 1913	226	25·0	..	2	550	7,500	27·0	6 12-pdrs.	3	71	95
FIRST CLASS—													
Snoegg, Stegg, Trygg	Horten	1919	175	18	5¼	2	220	3,500	25	2 12-pdr.	4	..	..
SECOND CLASS—													
Varg (8), Raket (9)	Horten	1894	111·5	12·4	..	1	43	650	19	..	2	14	..
Hval, Delfin, Hai (3 boats)	Elbing	1896	128·0	15·0	6·9	1	84	1,100	24·5	2 1·4-in. Q.F.	2	19	..
Storm, Brand, Treds	Horten	1899	128·0	15·0	..	1	84	1,100	23	2 1·4-in. Q.F.	2	..	..
Laks, Sild, Sael, Skrei	Horten	1900	128·0	15·0	6·9	1	84	1,100	23	2 1·4-in.	2	..	..
Kjek, Hvas, Dristig, Kvik, Djerv, Blink,	Fredrikstad	1898	111·5	14·5	6·3	1	65	650	19	2 1·4-in.	2	..	..
Lyn, Glimt, Hauk, Falk	Horten	1903											
Skarv, Telst, Lom, Jo, Grib	Horten	1906–7	134·5	14·9	..	1	100	1,700	25·0	2 3-pr.	2	18	..
Ravn, Orn	Horten	1903	119	14·9	6·4	1	73	1,035	22·5	2 1·4-in.	2	14	13
Kjell	Horten	1912	135	14·9	6·4	1	100	1,800	25	1 12-pr.	3	19	..
SUBMARINES—													
A 1, 2, 3, 4	Germania Kiel	1909 to 1913	131·6	14·9	9·6	2	220 / 255	440 / 250	12 / 9	..	3	17	..
MINING VESSELS:—													
Froeya	Horten	1917	250	27	8½	2	755	..	22	4 4-in.	2	80	..
Glommen, Laugen	Christiania	1918	138	28	6½	2	335	..	9·5	2 12-pdr.	..	39	..

Roumania.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons
FIRST CLASS—													
Naluka*	Havre	1888	120·7	11·3	6·9	1	56	578	21	1 1-pr. rev.	2	..	12
Sborul	Havre	1888	120·7	11·3	6·9	1	56	578	21	1 1-pr. rev.	2	..	12

8 100 ft. Torpedo Vedette Boats built by the Thames Iron Works. 4 built by Schichau, 1904, Vedea, Argosul, Trotcul, Telcerman, for the Danube.

* Smeul of this class lost in the Black Sea, May 1917.

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Russia.

This list is given with little alteration. Nothing is known of the situation or disposal of most of these destroyers and submarines. Those known to have been sunk have been removed from the list.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
BALTIC.			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Kondratenko, Pogranitschnik, Siberskij-Strelok ..	Abo and Helsingfors	1905	250·3	27·0	8·9	2	625	7,300	25–26	2 12-pdrs. 6 6-pdrs.	3	100	191
Amuretz, Gaidamak, Ussurietz, Vsadnik ..	Kiel (Germania)	1905 1906	232·9	23·7	7·9	2	560	6,500	25–26	2 12-prs. 6 6-prs.	3	98	180
Emir Bukharsky, Finn, Moskvityanin	Helsingfors	1905	238	27·0	8·6	2	580	6,500	25–26	2 12-pdrs. 6 6-pdrs.	3	98	134
Donskoi – Kasak, Sabaikaletz, Steregushtshi, Strashny, Trukhmenetz-Stavropolski, Ukraina, Voiskovo	Riga	1904 1906	239·9	23·7	7·6	2	508	6,200 7,020	25–27	2 12-pdrs. 4 6-pdrs.	2	90	50 120
Prytki	Poplar	1895	190	18·6	7·0	2	240	4,400	29.7	1 12-pr, 3 3-pr	2	..	..
Revy, Retivy, Ryany, Rezviyi, Prosorlivy, Ridny, Posluchny, Protchny, Poratsuchtchi, Podvitsny ..	Abo, Ishora & Nevsky ..	1898	196·9	18·4	11·5	2	240	3,800	27	1 12-pr, 3 3-pr	2	55	53
Bravi, Vidny, Bodry	Nevsky and Ishora ..	1900–2	196 9	18·4	11·5	2	350	6,000	27	1 12-pr, 5 3-pr	3	62	80
Grozni, Grosiashtchi	Petrograd ..	1904	196·9	18·4	11·5	2	350	6,000	27	1 12-pr, 5 3-pr	3	62	80
Tverdy, Totschny, Travoshny	Abo	1905	196·9	18·4	11·5	2	240	6,000	27	1 12-pr, 5 3-pr	3	62	80
Iskousny, Kriepky, Legky	La Seyne ..	1905	185·9	21·0	7·5	2	324	5,600	26	1 12-pr, 5 3-pr 2 M	2	60	30 100
Lovki, Lichoi	Havre (Normand)	1905	185·8	21·0	7·5	2	324	5,600	27·5	1 12-pr, 5 3-pr 2 M	2	60	30 100
Bolevoi, Burni, Vnimatelni, Vnushitelni, Vynoslivny, Sergieff, Yurasovsky, Sviereff, Dmitrieff	Elbing Schichau	1905–6	208·9	23·0	..	2	365	6,500	28	..	3		95
Silni, Storoshevoi, Stroiny, Rasyashtshy, Rastoropny, Dostoiny, Deyatelni, Myetky, Molodetsky, Moshtshny, Malieieff, Anastosoff	Petrograd and Ochta	1905 1907	185·9	21·0	7·5	2	335 56	5,600	26	1 12-pr, 5 3-pr 2 M	2	60	30 100
Novik	Stettin (Vulcan)	1911	336·6	31·3	8·7	..	1200	36,000	37·3	4 4-in., 2 M.	4 dbl	..	..
Leit. Ilin, Kapt. Konon Zotov, Kapt. Kingsbergen, Kapt. Kroun, Kapt. Belli, Kapt. Izuilmetev, Kapt. Kern, Leit. Dubasov	Petrograd (Putiloff)	1914 & Bldg.	..	..	..	..	1200– 1300	30,000	36	3 4-in , 4 M.	5 dbl.	..	..
Orphei, Zabiaka, Pobieditel, Letun, Desna, Samson, Azard	Petrograd (Metal Works)	1914, 1915, & Bldg.	..	..	..	..	1200– 1300	30,000	36	3 4-in , 4 M.	5 dbl.	..	..
Gavrul, Mikhail, Vladimir, Konstantin, Sokol, Leit. Lombard	Reval (Parvlainin Works)												
Gromonosetz, Avtroil, Bryachislav, Fiodor - Stratilat, Pryamislav	Reval Shipbldg. Works												
Hogland, Grenhamn, Stirsuden, Patras, Khios, Tenedos, Ruimnik, Smolensk, Kulm	Riga (Ziese Yard)												

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Russia—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
BALTIC.			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
SUBMARINES—													
Delfin	Petrograd ..	1903	65	12	..	..	115–150	..	6	..	3	..	..
Graf Sheremetieff, Kassatka, Nalim Skat	Petrograd ..	1904	65	12	..	..	150–200	100 60	8-6	..	4	..	..
Som, Shtshuka ..	Petrograd ..	1904	65	12	..	..	120	160	9·5–7	..	2	..	..
Assiotr, Kefal.. ..	Petrograd ..	1905	70	13	..	..	135–175	400	10–7	..	3	..	..
Bialuga, Pescar, Sterliad	Petrograd ..	1904	66	13	..	..	120	160	9–7	..	2	..	..
Sig	Petrograd ..	1904	66	13	..	..	135–175	..	10–7	..	3	..	..
Makrel, Okun.. .. Potschovy	Petrograd ..	1907 1908	110	..	..	..	150–200	100–60	8·6	..	6	..	..
Alligator, Drakon, Kaiman, Krokodil..	Petrograd ..	19 8	132	14·2	..	..	450–500	..	12-10	..	2	..	..
Minoga	Petrograd ..	1908	117	..	..	..	126	..	..	..	2	..	..
BLACK SEA.													
DESTROYERS—													
Saken	Nicolaieff ..	1907–8	241·6	27·0	7·9	2	614	6,500	25	6 12-pdrs.	3	90	200
Zavidni, Zavetni, Zharki, Zhutki, Zhivoi, Zhivulka	Nicolaieff ..	1903-4	210	21·2	7	2	350	5,500	27	1 12-pr, 5 3-pr	2	..	..
Strogi, Svirepy ..	Abo	1901	190·4	18·5	11·5	2	240	3,800	27	1 12-pr, 3 3-pr	2	..	60
Zorki, Zvonki.. ..	Nicolaieff ..	1903	210	21·2	7	2	350	5,500	27	1 12-pr, 5 3-pr	2	..	..
Bespokoiny .. .. Bystry, Dersky, Gromky Pospieschny, Pilky, Stshastlivy	Nicolaieff .. Nevsky, Putiloff, &c.	1912 & 1914	..	..	..	..	1,050	25,000	31	3 4-in., 2 M.	5 dbl.	93	..
SUBMARINES—													
Lossos, Shudok .	Nikolaieff ..	1907	66	13	..	..	120	..	9–7	..	2	..	..
Karp, Karas	Germania ..	1907	130	..	..	..	200–240	600	12·10	..	1	..	..
Morsh, Nerpa, Tiulen	Nikolaieff ..	1913	165·6	17·6	..	..	460–600	2000–800	15–11·5	..	8	..	..
Kashalot Kit, Narval	Petrograd ..	1915	..	..	..	..	..	..	..	..	..	..	..
Krab (mine-layer)..	Nicolaieff ..	1912	171	..	..	..	500–700	..	..	..	2	..	..
FAR EAST.													
DESTROYERS—													
Bespochtchadni, Bestrachni, Beschumni (3 boats)	Elbing ..	1899	196·9	18·4	11·5	1	350	6,000	27	1 12-pr, 5 3-pr	2	..	..
Grozovoi, Vlastni ..	Havre (F. & C.)	1900–2	186·0	20·8	10·3	2	300	5,000	28	1 12-pr, 5 3-pr	2	..	80
Boiki	Nevsky ..	1900	196·9	18·4	11·5	1	350	6,000	28	1 12-pr, 5 3-pr			

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Spain.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Terror	Clydebank ..	1896	220	22	5·6	2	300	6,000	28	2 12-pr. 2 6-pr. 21-pr.	2	67	100
Audaz													
Osado	Clydebank ..	1897	225	25·6	5·8	2	400	7,500	30	2 14-pr. 2 6-pr. 21-pr.	2	70	90
Proserpina													
Bustamente	Cartagena ..												
Villamil	Cartagena ..	1915	220	22	7·5	..	370	6,250*	28	5 6-pr.	2	..	..
Cadarso	Cartagena ..												
FIRST CLASS—													
24 boats	Cartagena ..	1915& Pro.	164	17·2	4·9	3	183	3,750*	26	3 3-pr.	3	..	..
Azor	Poplar	1887	134·5	14	6	1	108	1,600	24	4 3-pr.	3	23	25
Halcón	Poplar	1887	134·5	14	..	1	108	1,600	24	4 3-pr.	3	23	25

Azor and Halcón re-boilered by Yarrow (water-tube). * Parsons' turbines and Normand type boilers.

Six additional destroyers in hand. In the 1914 programme are twenty-eight submarines, of which four were to be built in the United States. In September, 1917, three submarines (A 1, 2 and 3), built in Italy, were delivered, and six others were to follow, giving Spain a flotilla of ten boats, the tenth being the old Peral.

Sweden.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Mode	Yarrow ..	1902	220·3	20 6	8·9	2	400	6,800	32·4	1 12-pr. 5 6-prs.	2	55	95
Magne	Thornycroft	1905											
Wale	Malmo ..	1906											
Ragnar	Malmo ..	1909											
Sigurd	Gothenburg	1909	216·9	20·8	8·2	2	430	7,200	30·0	2 12-prs. 4 6-prs.	2 dbl.	63	90
Vidar	Malmo ..	1909											
Hugin	Gothenburg	1909											
Munin	Malmo ..	1910											
Wrangel	Gothenborg	1918	230	22	8·2	2	500	..	30 0	2 12-prs., 6 4-prs.	2 dbl.	..	..
Wachtmeister													
FIRST CLASS—													
Blixt	Carlskrona ..	1898	128	15·9	6·11	1	92	1,260	23·5	2 1·9 in. Q.F.	2	18	17
Meteor	Carlskrona ..	1899	128	15·9	6·11	1	92	1,330	23·8	2 1·9-in. Q.F.	2	18	17
Stjerna	Carlskrona ..	1899	128	15·9	6·11	1	92	1,250	23·4	2 1·9-in. Q.F.	2	18	17
Orkan	Carlskrona ..	1900	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Vind	Carlskrona ..	1900	128	15 9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Iris	Carlskrona ..	1900	128	15·9	6·11	1	92	1,250	23 5	2 1·5-in. Q.F.	2	18	17
Virgo	Carlskrona ..	1902	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Mira	Carlskrona ..	1902	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Orion													
Sirius	Carlskrona ..	1903	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Kapella													
Pleiad, Castor, Pollux	Normand ..	1909	125	15	6·6	1	96	1,900	26	2 1·5-in. Q.F.	2	18	20
Vega	Carlskrona ..	1910	125	17·5	8·6	1	105	1,900	25	1 6-pr. 1 1·4-in.	2	18	20
Vesta													
Spica, Astrea, Iris, Thetis	Bergsund and Gothenburg	1910	125	17·5	8·6	1	105	1,900	25	1 6-pr. 1 1·4-in.	2	18	20
Altair													
Antares													
Argo	Stockholm ..	1908	128	17·5	8·6	..	110	2,000	25	2 6-prs.	2	18	20
Arcturus													
Perseus, Polaris ..	Bergsund ..												
Regulus, Rigel ..	Stockholm ..	1910	128	17·5	8 6	1	110	2,000	25	12 6-pr.	2	18	20
A, B, C, D	Carlskrona & Gothenburg	1915											
SUBMARINES—													
Enroth	Stockholm ..	1902	82·0	13·0	11·6	2	146	100	12-11	..	1	..	..
Hajen	Stockholm ..	1903	65·0	11·6	..	..	120	200	10-7	..	..	..	..
No. 1	Muggiano ..	1908	139·6	14·2	6·9	..	185–235	750	15–7½	..	2	15	..
Nos. 2, 3, 4	Stockholm ..	1911	136·6	14·2	6 9	..	185–535	750	15–7½	..	2	15	..
Svaerdfisken	Malmö	..	..	..	..	..	250 370	..	..	..	2	..	..
Tumlaren													

Also ten small torpedo-boats, 60 tons, built 1907–1908. Submarine Delfin completed by the Bergsund firm, Aborren, Laxen, and Gaeddan at Malmö, and two others at the latter place have been completed or are nearing completion.

Details of the Swedish submarines are given under reserve. The above list is believed not to be correct in all particulars, but the facts are confidential.

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Turkey.

The torpedo craft and submarines named in this list, and some others, have been surrendered for internment at the Golden Horn.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Berk-Efshan	Kiel	1894	187	21·6	..	2	270	1,200	25	6 1-pr. revs.	2	..	..
Tajjar	Kiel	1894	187	21.6	..	2	270	..	25	6 1-pr. revs.	2	..	..
Samsoun, Basra, Tassos, Jadighiar-i-Millet	Bordeaux	1907–8	184·9	19·6	9·6	2	280	..	28	1 9-pr., 6 3-pr.	2	..	26
Muavenet-i-Millet, Mahabet-i-Wstan, Nuhum-i-Hamijet	Elbing (Schichau)	1909	236·6	25·6	12·3	2	610	14,000	35	2 3·4 in. 2 M.	3	..	160
FIRST CLASS—													
Ac-Hisar	Sestri Ponente	1904	165·8	18·6	4·5	..	165	2,200	27	..	..	..	..
Urffa, Tokat, Deradj, Kulahia, Mossul	Sestri Ponente	1906	165·8	18·6	4·5	..	165	2,200	24	..	..	..	..
SUBMARINE—													
Ahmed (ex Turquoise)	Toulon	1908	146	12 9	12 0	2	390	600	12	..	6	..	..

United States.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament. Guns.	Torpedo Tubes.	Complement.	Maximum Fuel Capacity.
DESTROYERS—			ft. in.	ft. in.	ft. in.		Tons.		Knots.				Tons.
Smith	Philadelphia	1909	289 0	26 0	8 0	3	700	10,362*	29·5 *t.*			89	285
Lamson	Philadelphia	1909	289 0	26 0	8 0	3	700	10,000*	29·5			89	285
Preston	Camden, N.J.	1909	289 0	26 0	8 0	3	700	10,000*	28			89	270
Flusser	Bath, Me.	1909	289 0	26 0	8 0	3	700	11,842*	30·41 *t.*			89	295
Reid	Bath, Me.	1909	289 0	26 0	8 0	3	700	12,734*	31·82 *t.*			89	295
Paulding	Bath, Me.	1910	289 0	26 1¼	8 4	3	742	12,000*	29·50			89	210
Drayton	Bath, Me.	1910	289 0	26 1¼	8 4	3	742	12,000*	29·50			89	210
Roe	Newport News, Va.	1909	289 0	26 1¼	8 4	3	742	12,000*	29·50			89	210
Terry		1909	289 0	26 1¼	8 4	3	742	12,000*	29·50			89	210
Perkins	Quincy, Mass.	1910	289 0	26 1¼	8 4	2	742	12,000†	29·50	5 3-in., 2 M.	3 18-in.	89	216
Sterrett	Quincy, Mass.	1910	289 0	26 1¼	8 4	2	742	12,000†	29·50			89	216
McCall	Camden, N.J.	1910	289 0	26 1¼	8 4	3	742	12,000*	33·0			89	210
Burrows	Camden, N.J.	19 0	289 0	26 1¼	8 4	3	742	12,000*	29·50			89	210
Warrington	Philadelphia	1910	289 0	26 1¼	8 4	2	742	12,000‡	30			89	210
Mayrant	Philadelphia	1910	289 0	26 1¼	8 4	2	742	12,000‡	29·50			89	210
Monaghan	Newport News	1911	289 0	26 1¼	8 4	3	900	12,000*	30			89	210
Trippe	Bath, Me.	1911	289 0	26 1¼	8 4	3	900	12,000*	29·50			89	210
Walke	Quincy, Mass.	1911	289 0	26 1¼	8 4	2	900	12,000†	29·50			89	216
Ammen	Camden, N.J.	1911	289 0	26 1¼	8 4	3	900	12,000*	29·50			89	210
Patterson	Philadelphia	1910	289 0	26 1¼	8 4	3	900	12,000*	30			89	210
Peale, Fanning, Henley, Jarvis, Jouett	Quincy, Mass.	1911	289 0	26 1¼	8 4	3	900	12,000	30·3	5 3-in., 2 M.	3 18-in.	89	210
Aylwin, Balch	Philadelphia	1912											
Benham, Cassin	Philadelphia	1913	300 0	30 6	9 3	2	1010	16,000	29‡	4 4-in., 2 M.	3	98	300
Cummings	Bath	1914											
Downes	Bath	1914											
Duncan	New York	1913	300 0	30 6	9 3	2	1010	16,000	29·8 / 30·3	4 4-in., 2 M.	3	98	300
Parker	Quincy, Mass.	1913											
Cushing, Ericsson, McDougal, Nicholson, O'Brien, Winslow	Philadelphia, Bath, Me., New York	1914 / 1915	310 0	30 6	9 3	2	1050	17,000	29·8 / 30·3	4 4-in., 2 M.	4 dble.	93	300
Tucker, Porter, Wadsworth, Conyngham, Wainwright	Cramp, Fore River, Quincy	1915 / 1916	310 0	30 6	9 3	2	1050	17,000	29 8 / 30 3	4 4-in., 2 M	4 dble.	98	300

* Parsons turbines. † Curtis turbines. ‡ Zoelly turbines.

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United States—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament. Guns.	Torpedo Tubes.	Complement.	Maximum Fuel Capacity.
Destroyers—cont.			ft. in.	ft. in.	ft. in.		Tons.		Knots.				Tons.
Abbot Allen Anthony *Badger* Bailey, Ballard Barney Bell *Blakeley* Boggs Breckenridge Breese Bush Caldwell Champlin, Chew Claxton Colhoun Conner Craven Crosby Davis Delphy Dent, Dorsey *Dyer* Edwards Evans, Fairfax Gamble *Greer* Gregory Gridley Gwin Harding, Hart Hazlewood Hopewell *Ingraham* Israel	Mare Island, Union I.W., New York, Philadelphia, Quincy, Baltic, Me., Seattle	1916 1917 1918 and Bldg.	310 0	31 0	9 0	2	1213 1071 1085 1211 1215 1165 1184 1165 1155 1105 1213 1185 1085 1185 1154 1185 1121 1085 1185 1071 1215 1165 1185 1215 1154 1213 1165 1185 1185 1123 1185 1185 1213 1185 1185	18,000	35	4 4-in., 2 12-pr. A.A., or 2 13-pr.	4 triple	98	300
Jenkins	..	..	..	..	..	..	742	..	..	..	..	..	..
Kennison, Kilty *Kimberley* Lamberton Lansdale Lea *Little*, Ludlow Luce Mahan Manley Maury, McKee McKean Meredith *Montgomery* Mugford Murray, Palmer Philip *Radford* Ramsay Rathburne Ringgold *Robinson* Rowan Sampson Schley Shaw Sigourney Stevens Stockton Stribling Stringham Talbot, Tarbell Taylor, Ward Thatcher Thornton Upshur Walker Waters Wickes Wilkes Woolsey Yarnall	Newport News, New York, Philadelphia, Quincy, Baltic, Me., Fore River, Union I.W., Cramp	1917 1918 and Bldg.	310 0	31 0	9 3	..	1154 1185 1213 1185 1165 1185 1165 1135 1085 1185 1185 1185 1213 1185 1185 1154 1213 1213 1165 1185 1185 1126 1120 1185 1110 1185 1185 1121 1185 1185 1165 1154 1185 1215 1165 1185 1165 1154 1100 1154 1165	27,000	35	4 4-in., 2 12-pr. A.A., or 2 13 pr.	4 triple	98	300

United States Destroyer Programme:—Mr. Daniels, Secretary of the Navy, stated (December 30, 1918) that **470 destroyers were building in all.** In his list the number was 286—one (Gwin.), under the Act of 1915; 20, 1916; 15, 1917; 15, 1918; 76, Emergency Fund, 1917; 150, Deficiency Bill, 1917; 9, other Emergency Funds, 1917.

In the latest available official list of destroyers built and building the total number is 343, but of these 6 had been cancelled, and 12 were not under contract. Over 100 of these destroyers were in early stages, and had received no names.

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United States—*continued.*

Name or Numbers.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament. Guns.	Torpedo Tubes.	Complement.	Maximum Capacity.
COAST TORPEDO-BOATS—			ft. in.	ft. in.	ft. in.		Tons.		Knots.				Tons.
No. 1 (ex Foote)	..	..	..	..	..	..	165	..	..	..	..	..	..
No. 2.. .. .. (ex Rodgers)	..	..	..	..	..	..	142	..	..	..	..	..	..
No. 3.. .. .. (ex Du Pont)	Bristol, R.I.	1897	175 0	17 8	4 8	2	165	..	28·58	4 1-pr.	3	32	76
No. 4.. .. .. (ex Dahlgren)	Bath	1899	147 0	16 4	4 7	2	146	4,200	30	4 1-pr.	2	..	32
No. 5.. .. .. (ex Farragut)	San Francisco	1898	213 6	20 8	6 0	2	275	5,878	30·13	4 6-pr.	2	..	76
No. 6.. .. .. (ex Morris)	Bristol, R.I.	1898	138 3	15 6	4 1	2	105	1,750	24	3 1-pr.	3	..	28
No. 7 (ex Goldsborough)	Portland, Ore.	1902	194 8	20 5	5 0	2	250	6,000	27·40	4 6-pr.	2	..	131
No. 8.. .. .. (ex Bailey)	Morris Heights	1899	205 0	19 0	6 0	2	280	5,600	30·20	4 6-pr.	2	..	20
No. 9.. .. .. (ex Somers)	Schichau, Eibing ..	1898	149 3½	17 5	..	2	150	1,900	17·5	..	..	..	..
No. 10 .. .. (ex Bagley)	Bath	1900	157 0	17 0	4 7	2	175	4,200	29·15	3 3-pr.	3	29	..
No. 11 .. .. (ex Barney)	Bath	1900	157 0	17 0	4 7	2	175	4,200	29·04	3 3-pr.	3	29	..
No. 12 .. .. (ex Biddle)	Bath	1900	157 0	17 0	4 7	2	175	4,200	28·57	3 3-pr.	3	29	..
No. 13 .. .. (ex Blakeley)	Boston ..	1902	175 0	17 6	4 8	2	196	3,000	25·58	3 3-pr.	3	29	70
No. 14 .. .. (ex De Long)	Boston ..	1901	175 0	17 6	4 8	2	196	3,000	25·52	3 3-pr.	3	29	70
No. 15 .. .. (ex Shubrick)	Richmond ..	1899	175 0	17 6	4 8	2	209	3,375	26·07	3 3-pr.	3	29	70
No. 16 .. .. (ex Thornton)	Richmond	1900	175 0	17 6	4 8	2	165	3,000	24·88	3 3-pr.	3	29	70
No. 17 .. .. (ex Tingey)	Baltimore ..	1902	175 0	17 6	4 8	2	165	3,000	24·94	3 3-pr.	3	29	70
SUBMARINE—													
A2	Elizabethport	1902	63 4	11 9	..	1	120	160	8—7	..	1	7	..
A3	San Francisco	1902	63 4	11 9	..	1	120	160	8—7	..	1	7	..
A4	Elizabethport	1901	63 4	11 9	..	1	120	160	8—7	..	1	7	..
A5	San Francisco	1902	63 4	11 9	..	1	120	160	8—7	..	1	7	..
A6, A7	Elizabethport	1901	63 4	11 9	..	1	120	160	8—7	..	1	7	..
B1, 2, 3	Quincy, Mass.	1909	80 6	13 0	..	..	170	250	10—8½	..	..	19	..
C1-C5	Quincy, Mass.	1906-9	106 0	..	..	..	273	..	..	..	..	..	..
D1 D3	Quincy, Mass.	1909	..	..	..	..	(278–340)	500	..	..	(2 3)	10	..
E class .. .. (24 boats)	Quincy, Mass., &c.	(1913 1914)	181·0	22 9	2 7	..	(662–867)	1607–840	15—10	1 12-pr.	5	30	40
F, 2, 3, 4	San Francisco	(1914 1915)	160	13·0	..	2	(325–400)	800	9½—14	..	4	25	..
G1-6, 10, 12 ..	Newport News Philadelphia	(1914 1915)	186 0	22·6	13·3	..	(695–965)	1600–840	15½—9½	1 3 in. A.A.	5	30	40
H1-4, 7-9, 11, 12, 14, 15, 21-30, 41, 47 ..	Quincy, Mass., Philadelphia, &c.	(1914 1915)	170·9	15·9	13·9	..	(440–514)	420–320	12—10½	..	4	22	14
V1-4	..	..	147·6	16·3	11·0	..	(369–479)	900–300	14—9	..	2	20	17
J1-5, 7	..	..	274·0	23·6	14·0	..	(1200–1760)	3600–1400	19—9½	1 4-in.	6	20	80
K2, 3, 5-12, 14-16, 22	Quincy, Mass., &c.	..	339·0	26 6	16·0	..	(1880–2650)	10,000–1490	24—9½	1 4-in., 1 3-in.	8	54	170
L1-9, 11, 12, 14-17, 20, 55 ..	Newport News, &c.	(1916 1916)	233·6	23·5	12·0	..	(890–1080)	2400–1600	17½—10½	2 4-in.	6	65	..
M2-8..	Quincy, Mass & Navy Yard	1918	..	..	..	..	740	..	11—14	1 12-pr.	4	..	..
N1-7	..	1918	..	..	..	..	..	..	..	..	..	..	..
O1-16	..	1918	..	..	..	..	..	..	..	..	..	..	..
R1, 2, 7, 8, 9, 11, 12, 15-20	Navy Yards, &c.	1918	163	15·6	11·7	..	(420–505)	240–1200	9½—15	1 4-in.	6	22	13

Submarine F 1 lost in the war.
A considerable number of submarines are in hand.

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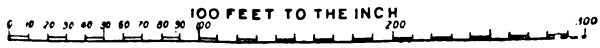
PLANS

OF

BRITISH AND FOREIGN SHIPS.

SCALE FOR PLATES.



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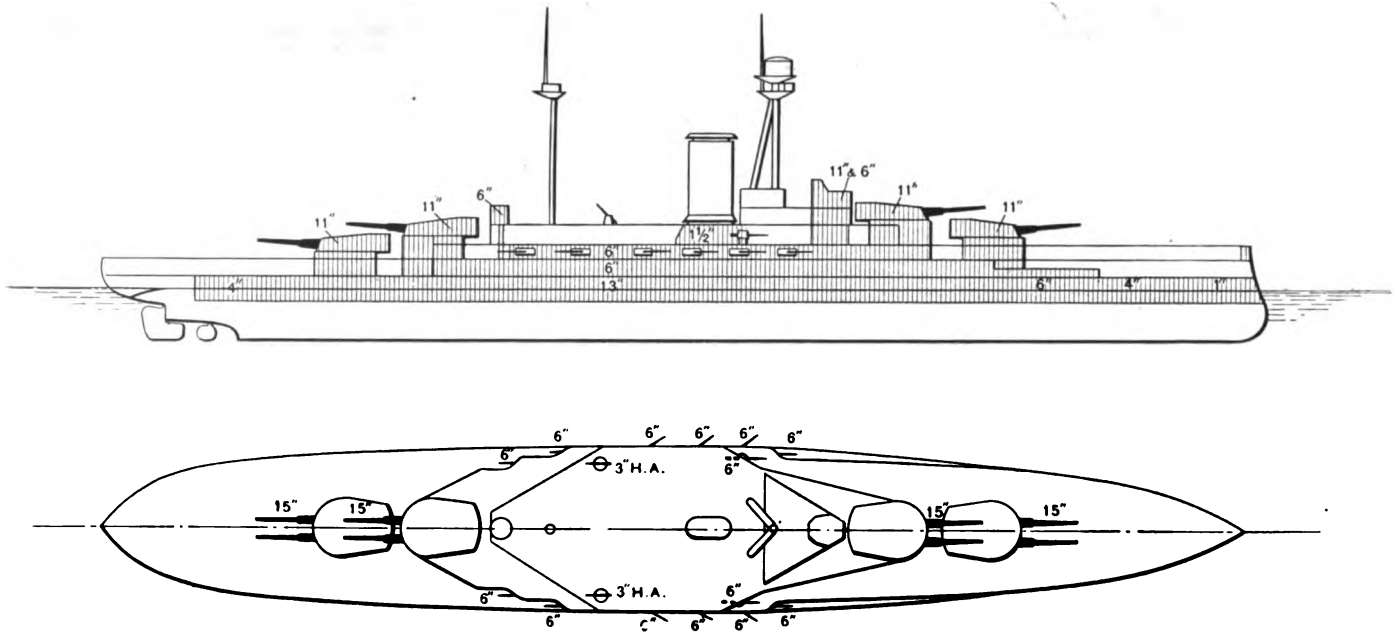
GREAT BRITAIN.

BATTLESHIPS.

Royal Sovereign. Royal Oak. Revenge. Resolution. Ramillies.



Length, 580 ft.; 25,750 tons; 23 knots; Completed 1916-7.
Armament, 8—15 in., 14—6 in., 2—3 in. H.A.

See pages 277, 278.

PLATE 1.
b 2

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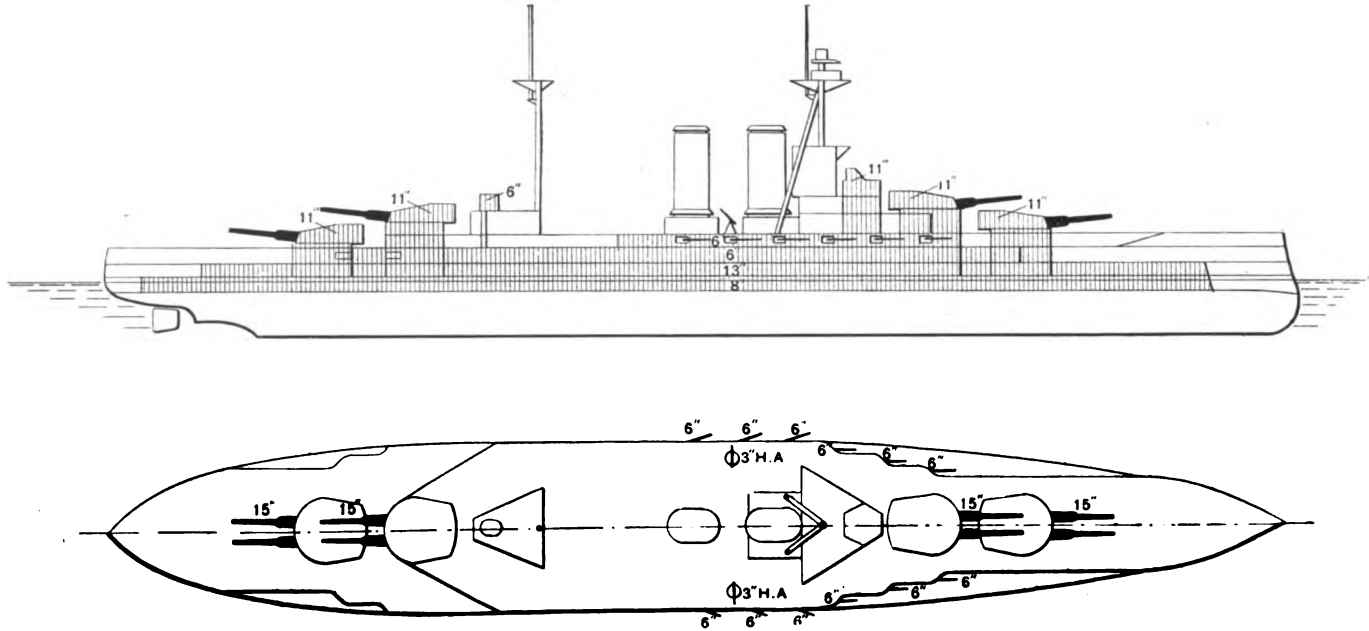
GREAT BRITAIN.

BATTLESHIPS.

Queen Elizabeth. Warspite. Barham. Valiant. Malaya



Length, 600 ft. ; 27,500 tons ; Speed, 25 knots ; Completed, 1915–1916
Armament, 8—15 in. ; 12—6 in. ; 2—3 in. H.A.

See pages 274, 277, 279.

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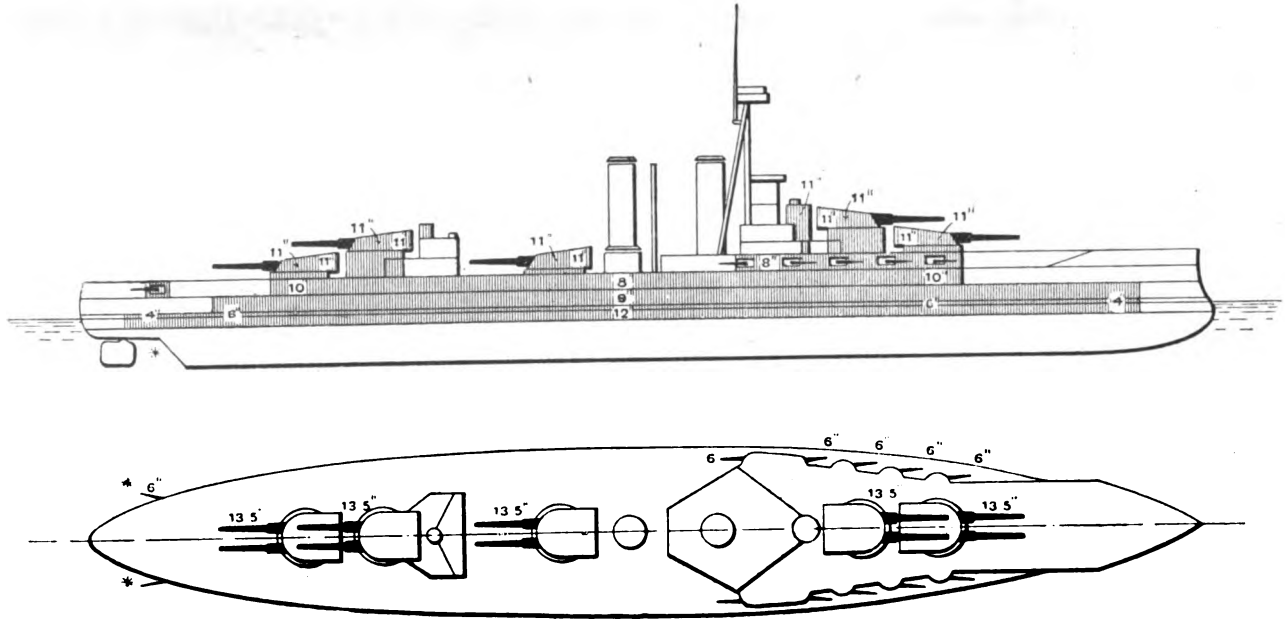
GREAT BRITAIN.

BATTLESHIPS.

Iron Duke **Marlborough.** **Benbow.** **Emperor of India.**



Length, 580 ft. ; 25,000 tons ; Speed, 21–22 knots ;
Armament, 10—13·5 in., 12—6 in., 2—3 in., 4—3 pr.

* These two guns have been removed to a position on forecastle abreast foremost funnel.

See pages 274, 276, 277.

PLATE 3

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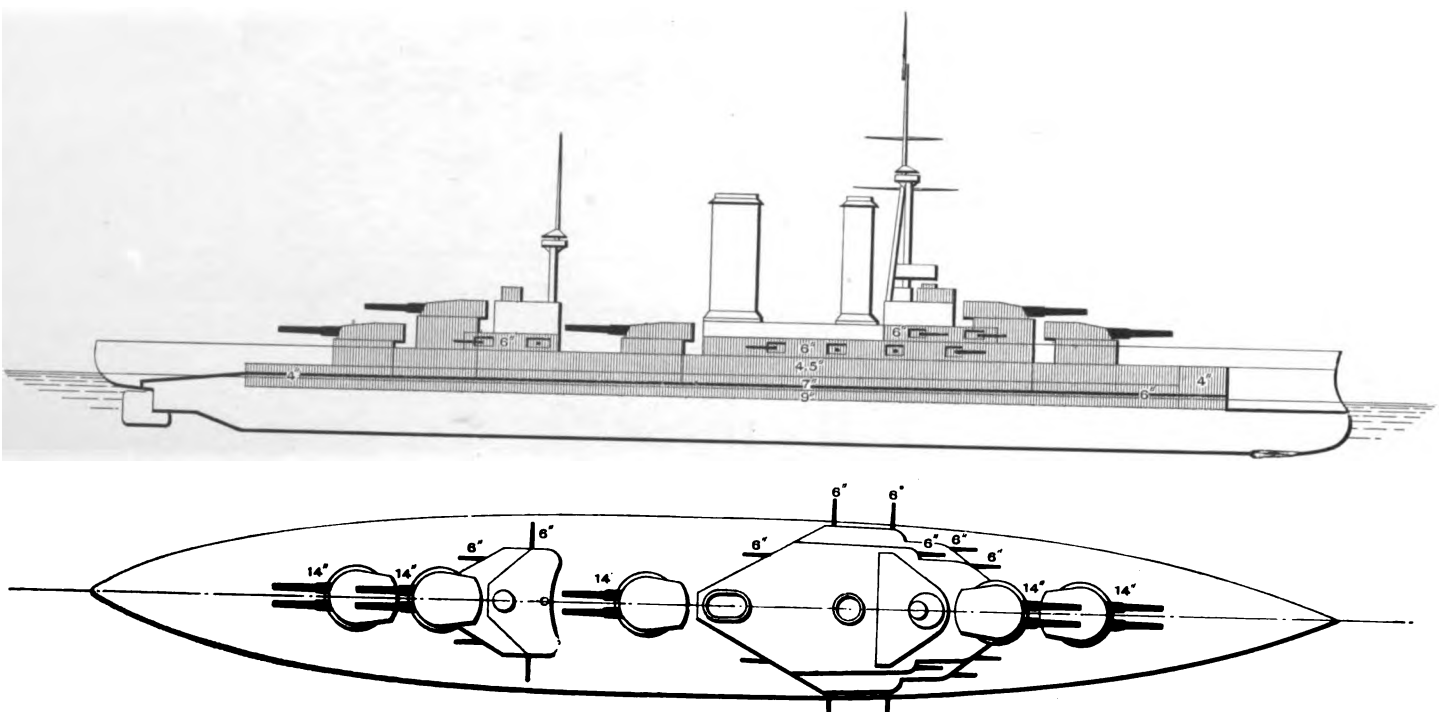
GREAT BRITAIN.

BATTLESHIP.

Canada (*Ex* **Almirante Latorre**).



Length, 625 ft. ; 28,000 tons ; Speed, 23 knots ;
Armament, 10—14 in. ; 16—6 in. ; 4—3 in. and smaller.

See page 274.

PLATE 4.

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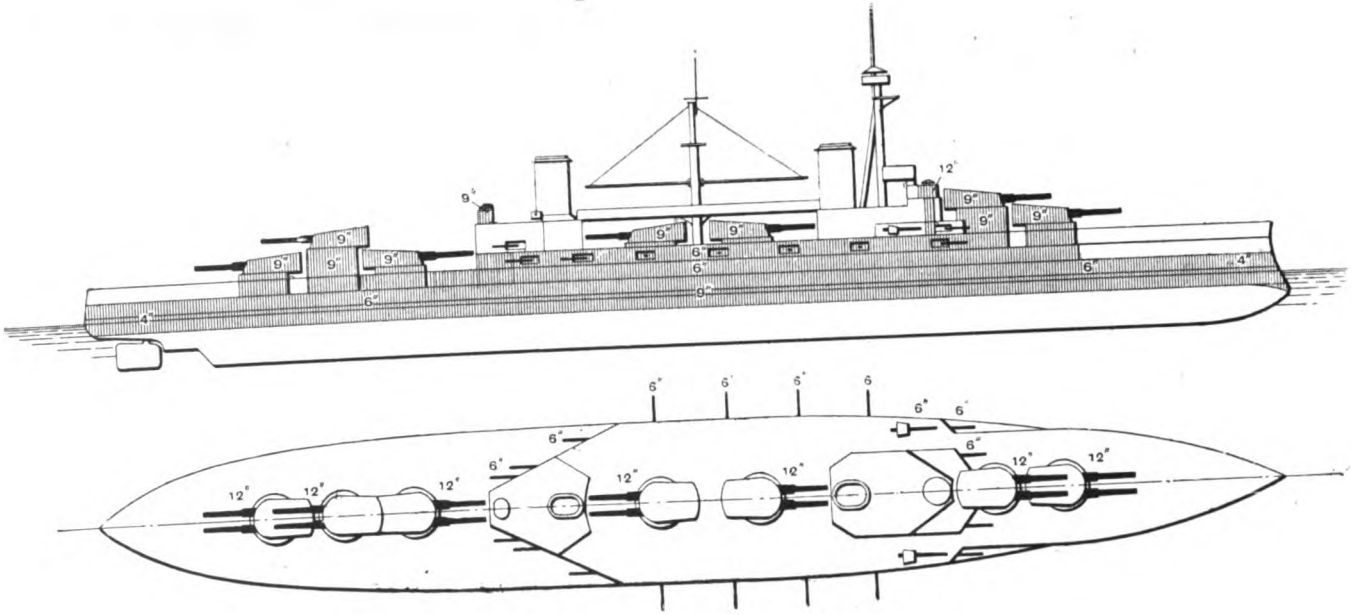
GREAT BRITAIN.

BATTLESHIP.

Agincourt (*Ex* Osman I).



Length, 632 ft. ; 27,500 tons ; Speed, 22 knots ;
Armament, 14—12 in. ; 20—6 in. 10—12 pr.

See page 274.

PLATE 5.

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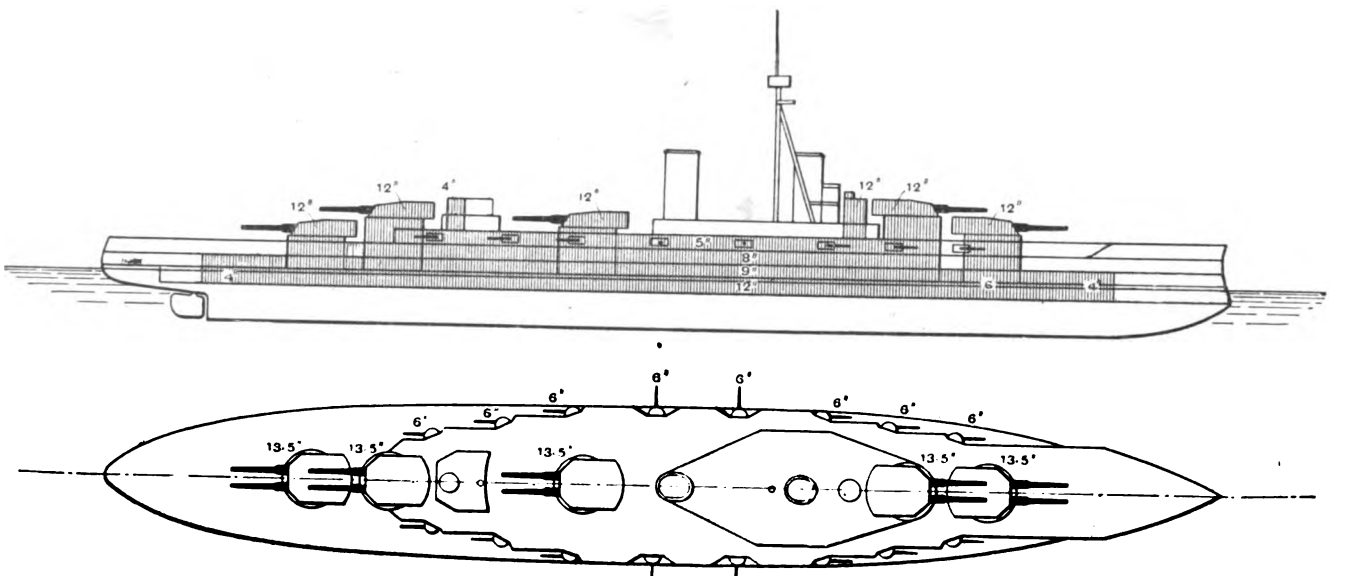
GREAT BRITAIN.

BATTLESHIP.

Erin (*Ex* Reshadieh)



Length, 525 ft. ; 23,000 tons ; Speed, 21 knots
Armament, 10—13·5 in., 16—6 in.

See page 276.

PLATE 6.

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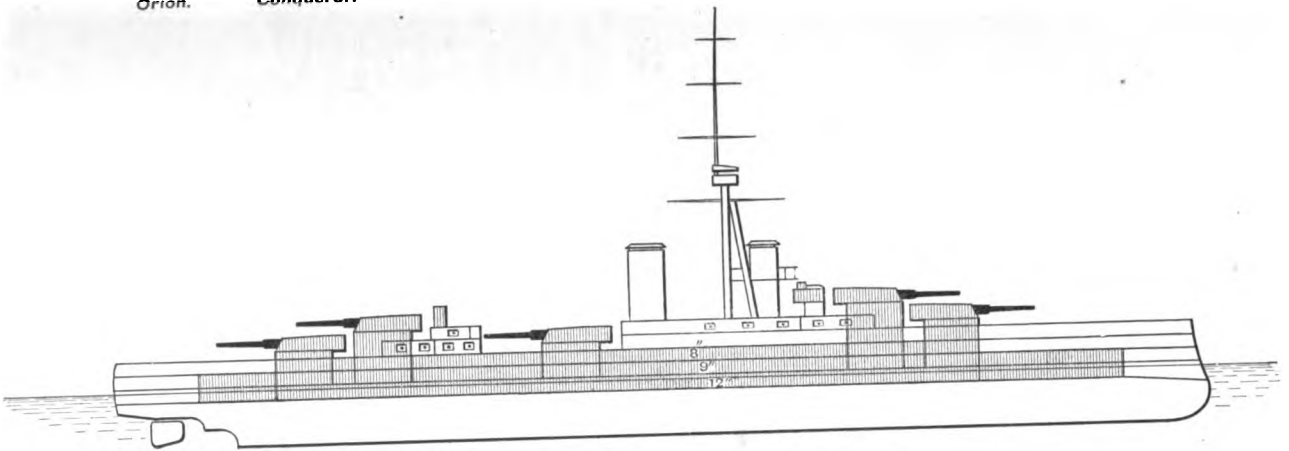
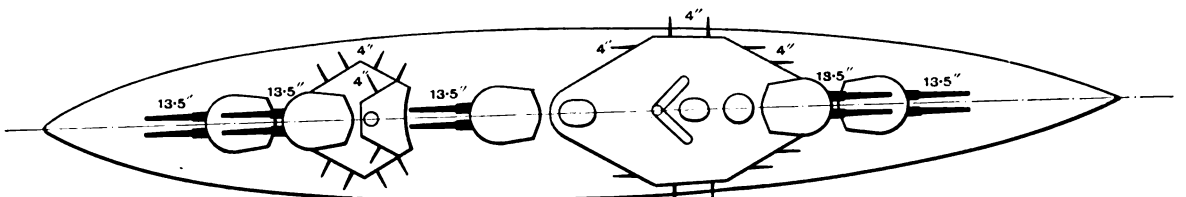
GREAT BRITAIN.

BATTLESHIPS.

Orion. Conqueror. Monarch. Thunderer. Ajax. Centurion. King George V.





Orion . . .
Conqueror .
Monarch. .
Thunderer . } Length, 545 ft. ; 22,500 tons ; Speed, 21-22 knots ; Armament, 10—13·5 in., 16—4 in., 4—3 pr., 5 small ; Completed, 1911-12.

Ajax . . .
Centurion .
King George V. } Length, 555 ft. ; 23,000 tons ; Speed, 22 knots ; Armament, 10—13·5 in., 16—4 in., 4—3 pr. ; Completed, 1912-13.

See pages 274, 275, 277, 278.

PLATE 1.

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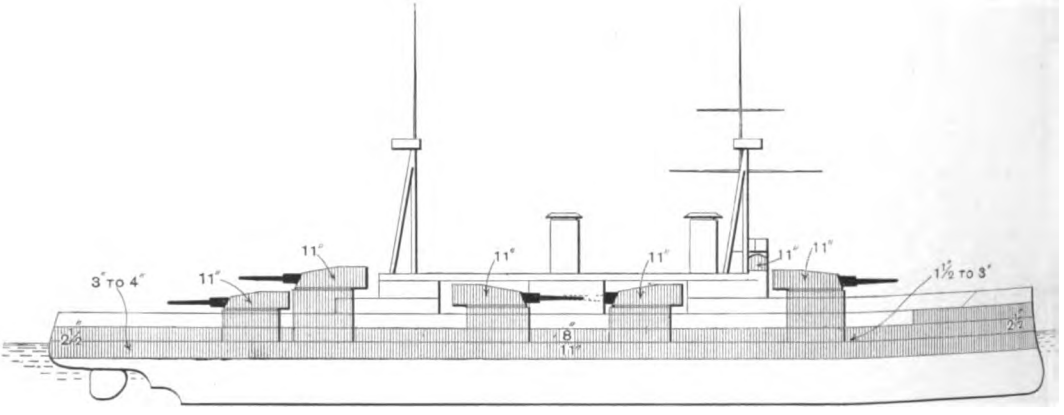
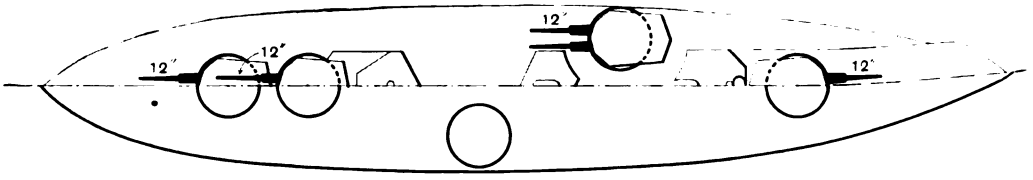
BATTLESHIPS.

Neptune. **Hercules.** **Colossus.**





Length, 510 ft.; 19,900–20,000 tons; Speed, 21·5–21·78 knots; Completed, 1911;
Armament, 10—12 in., 16—4 in., 4—3 pr., 5 small.

See pages 275, 276, 277.

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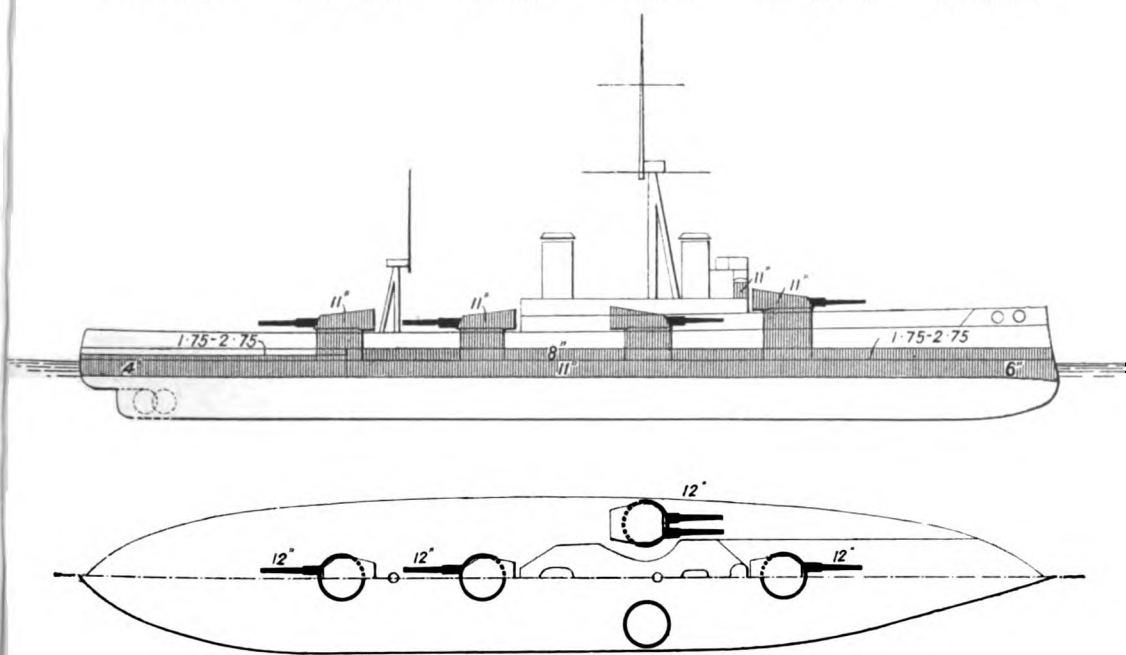
BATTLESHIPS.

Dreadnought. **Bellerophon.** **Temeraire.** **Superb.** **Collingwood.** **St. Vincent.**



Dreadnought.—Length, 490 ft. ; 17,900 tons ; Speed, 21·8 knots ; Completed, 1906 ;
Armament, 10—12 in., 24—12 pr., 5 small.

Bellerophon
Temeraire
Superb } —Length, 490 ft. ; 18,600 tons ; Speed, 21·6–22 knots ; Completed, 1909 ;
Armament, 10—12 in., 16—4 in., 4—3 pr., 5 small.

St. Vincent
Collingwood } —Length, 500 ft. ; 19,250 tons ; Speed, 21·5–22·1 knots ; Completed, 1910 ;
Armament, 10—12 in., 18—4 in., 4—3 pr., 5 small.

N.B.—The masts are differently arranged in the later ships.

See pages 274, 275, 278.

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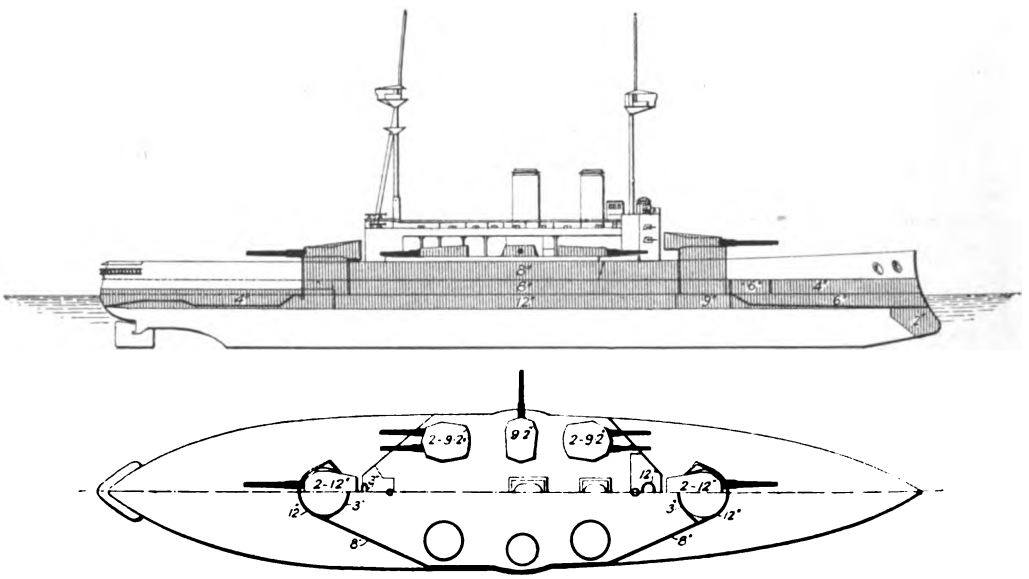
GREAT BRITAIN.

BATTLESHIPS.

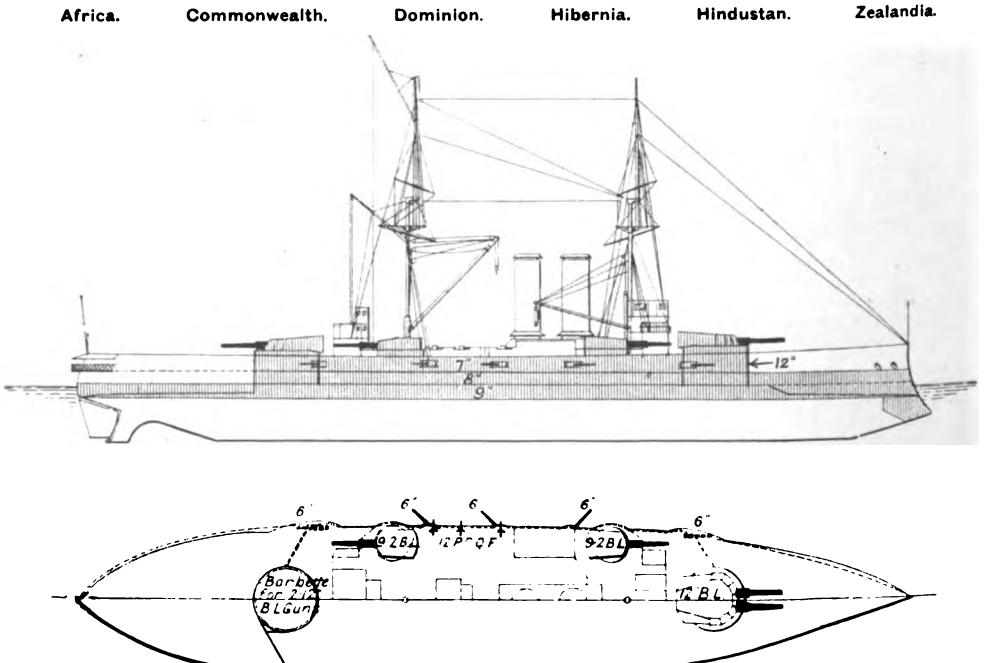
Lord Nelson. **Agamemnon.**



Length, 410 ft.; 16,500 tons; Speed, 18·75–18·9 knots; Completed, 1908;
Armament, 4—12 in., 10—9·2 in., 24—12 pr., 2—3 pr., 5 small.

See pages 274, 277.

Africa. **Commonwealth.** **Dominion.** **Hibernia.** **Hindustan.** **Zealandia.**



Length, 425 ft.; 16,350 tons; Speed, 18·5–19·5 knots; Completed, 1905–1906
Armament, 4—12 in., 4—9·2 in., 10—6 in., 12—12 pr., 12—3 pr.

See pages 274, 275, 276, 279.

PLATE 10.

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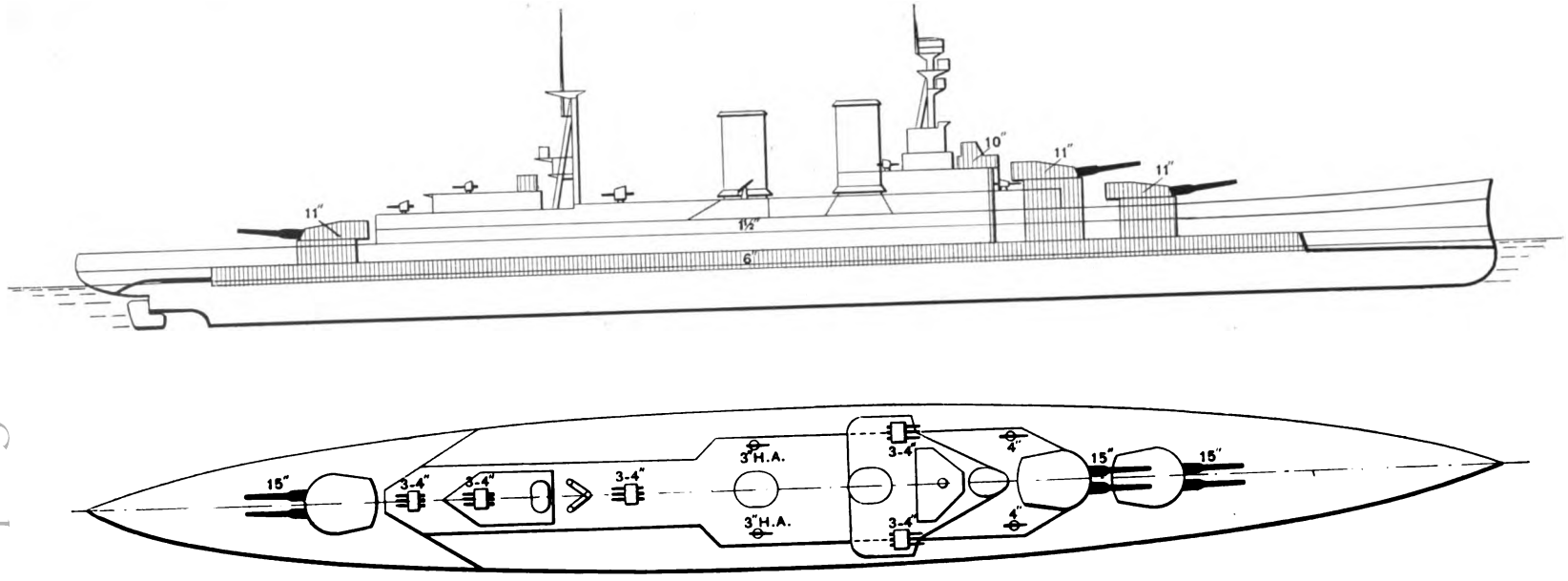
GREAT BRITAIN.

BATTLE-CRUISERS.

Repulse. **Renown.**



Length, 750 ft. ; 26,500 tons ; Speed, 32 knots ; Completed, 1916 ;
Armament, 6—15 in. ; 17—4 in. ; 2—3 in. H.A.

See page 278.

PLATE 11.

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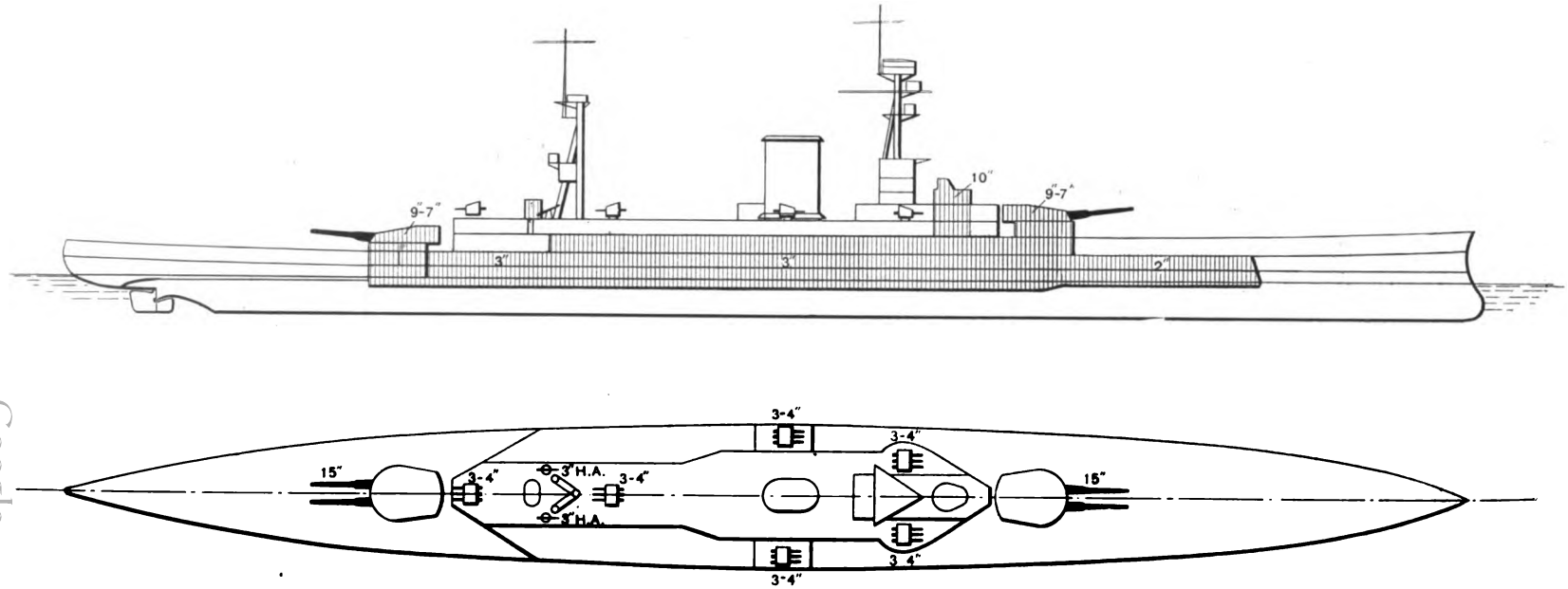
GREAT BRITAIN.

LARGE LIGHT CRUISERS.

Courageous. **Glorious.**



Length, 735 ft.; 18,600 tons; Speed, 32 knots; Completed, 1916.
Armament, 4—15 in., 18—4 in., 2—3 in. H.A

See page 283.

PLATE 12.

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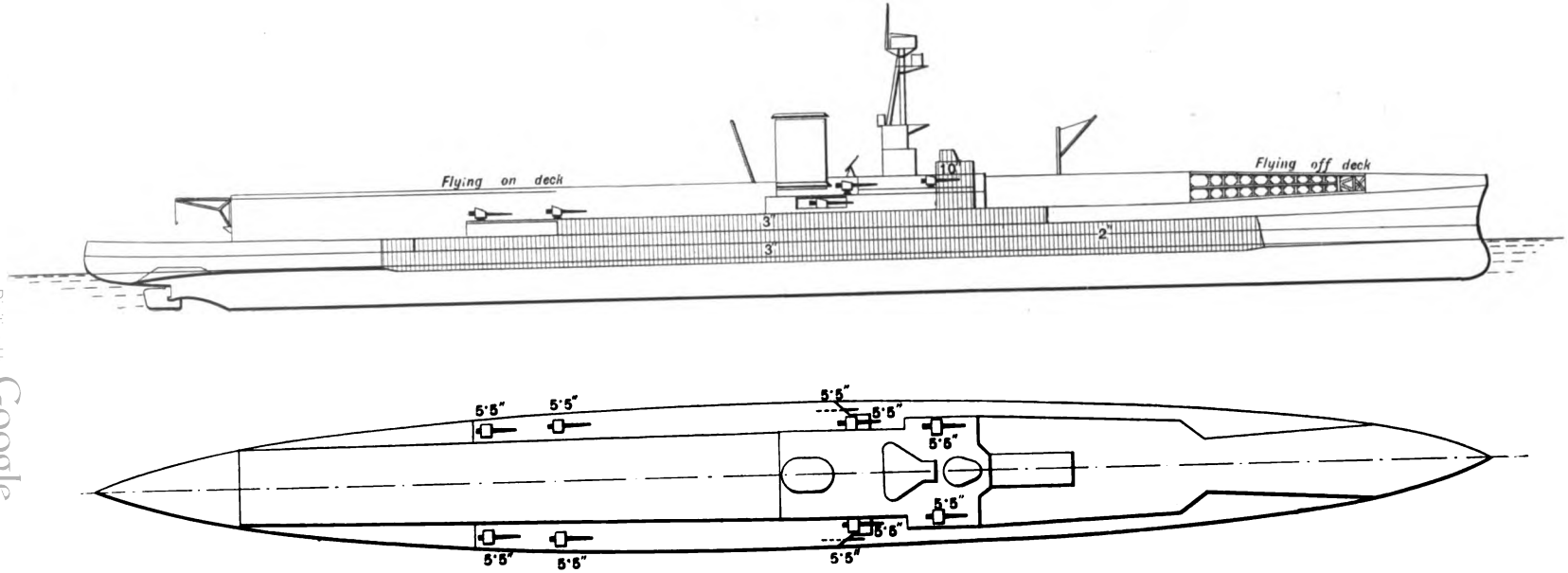
GREAT BRITAIN.

LARGE LIGHT CRUISER.

Furious.

(Seaplane Carrier.)



Length, 735 ft. ; 19,500 tons ; Speed, 31½ knots ; Completed, 1917 ;
Armament, 10—5·5 in.

See page 283.

PLATE 13.

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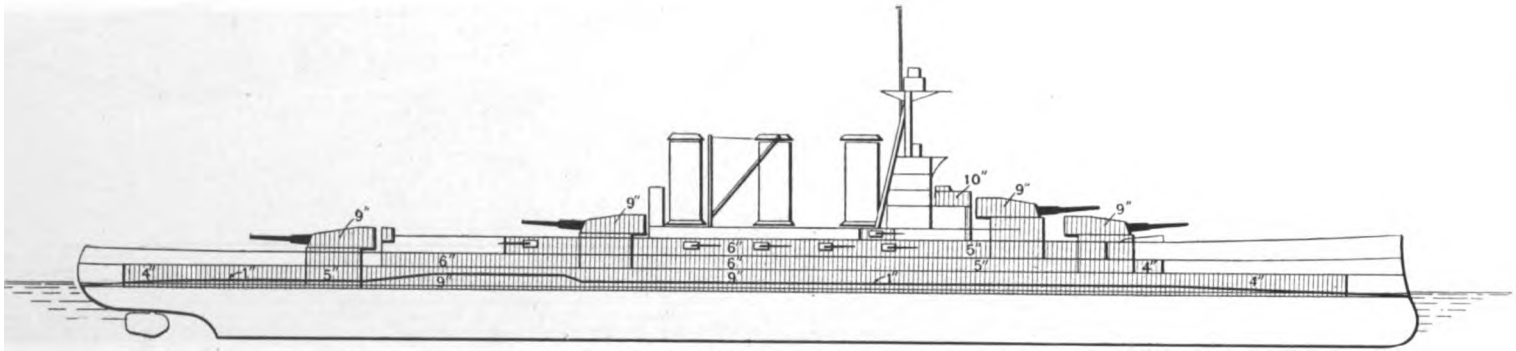
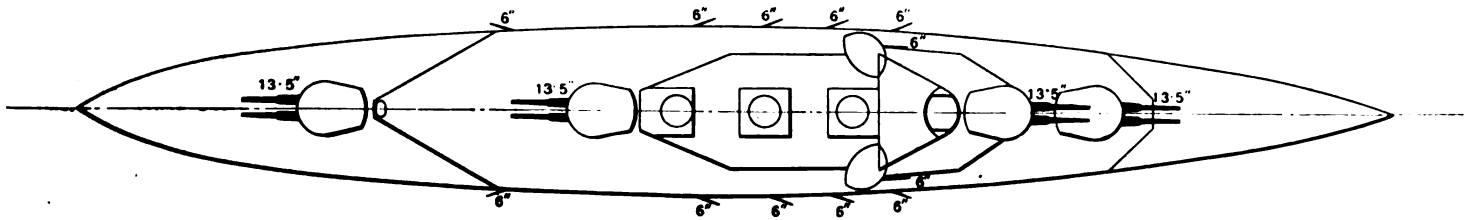
GREAT BRITAIN.

BATTLE-CRUISER.

Tiger.





Length, 660 ft. ; 28,500 tons ; 30 knots ; Completed, 1914 ;
Armament, 8—13·5 in. ; 12—6 in.

See page 279.

PLATE 14.

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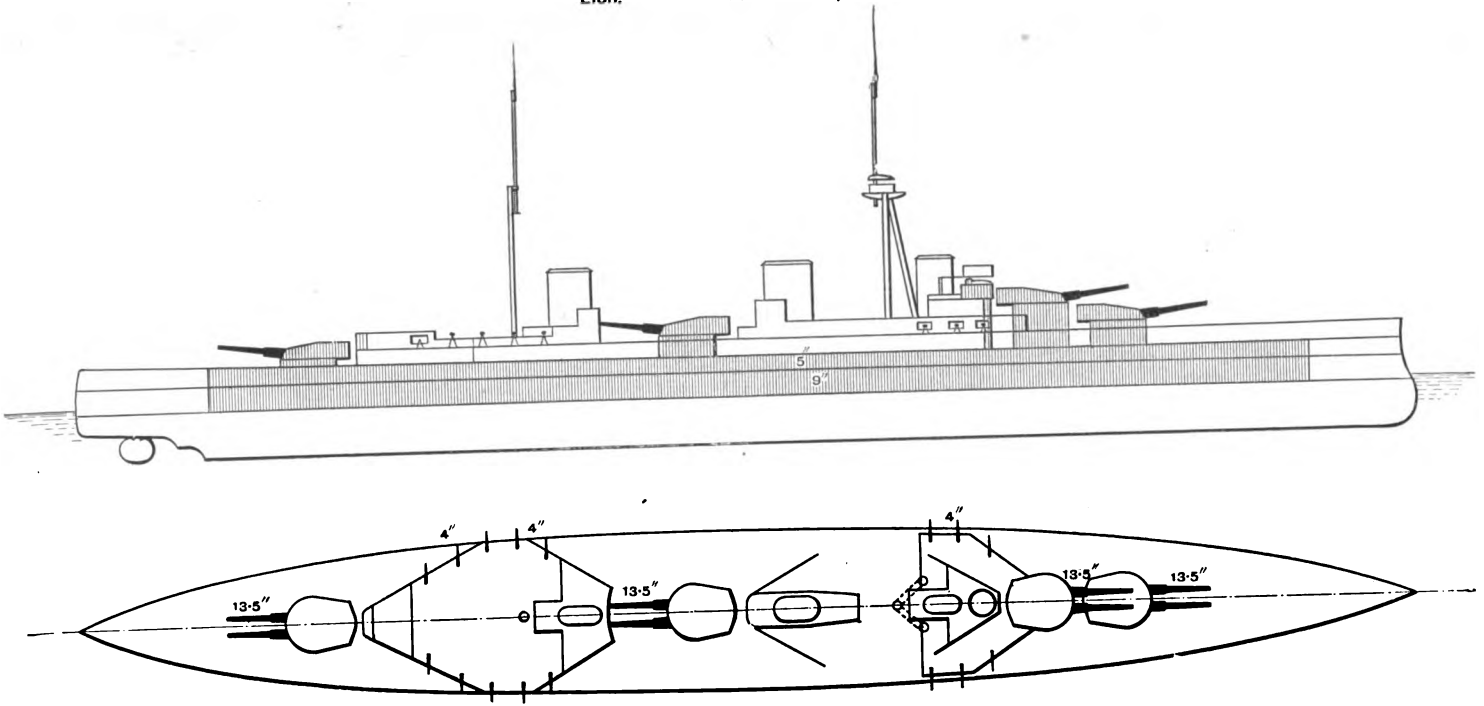
GREAT BRITAIN.

BATTLE CRUISERS.

Lion. Princess Royal.



Length, 660 ft.; 26,350 tons; Speed, 28–28·5 knots; Completed, 1912–13;
Armament, 8—13·5 in., 16—4 in., 4—3 pr., 4 small.

See page 277.

PLATE 15.
c

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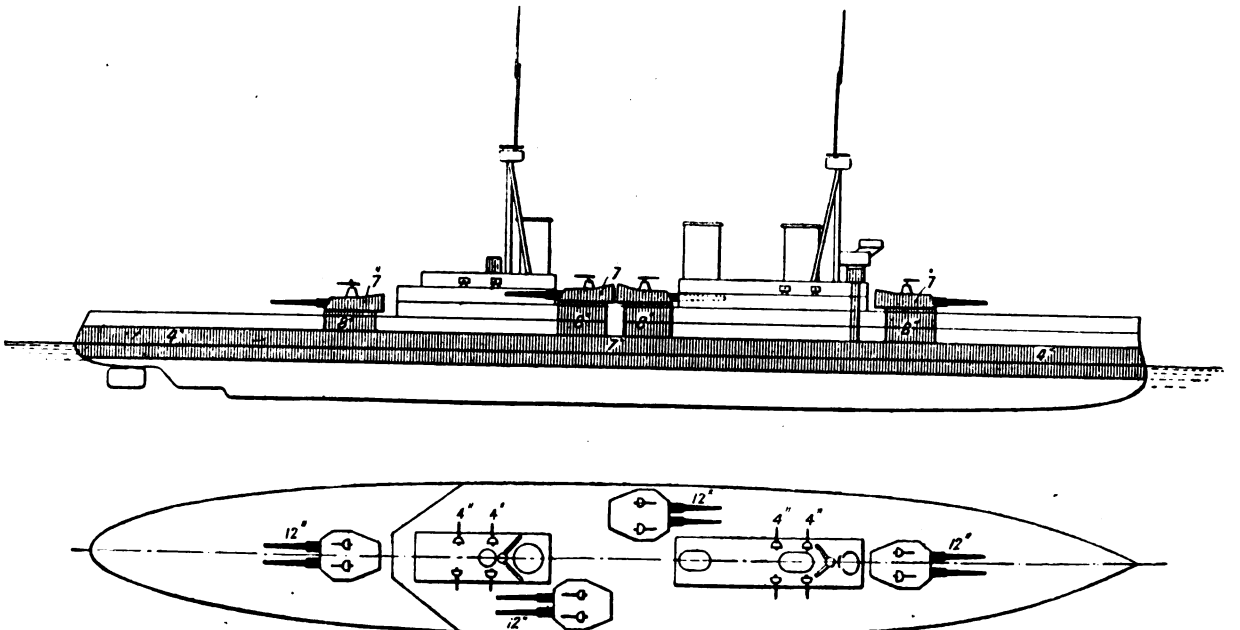
GREAT BRITAIN.

BATTLE CRUISERS.

Indomitable. **Inflexible.** **New Zealand.*** **Australia.***



Indomitable
Inflexible } Length, 530 ft. ; 17,250 tons ; Speed, 26 knots ; Completed, 1908–9 ; Armament, 8—12 in., 16—4 in., 5 small.

New Zealand
Australia } Length, 555 ft. ; 18,800 tons ; Speed, 25 knots ; Completed, 1911–13 ; Armament, 8—12 in., 16—4 in., 4—3 pr., 5 small.

* The centre turrets are more *en échelon* than in the two earlier ships.

See pages 276, 277, 288.

PLATE 16.

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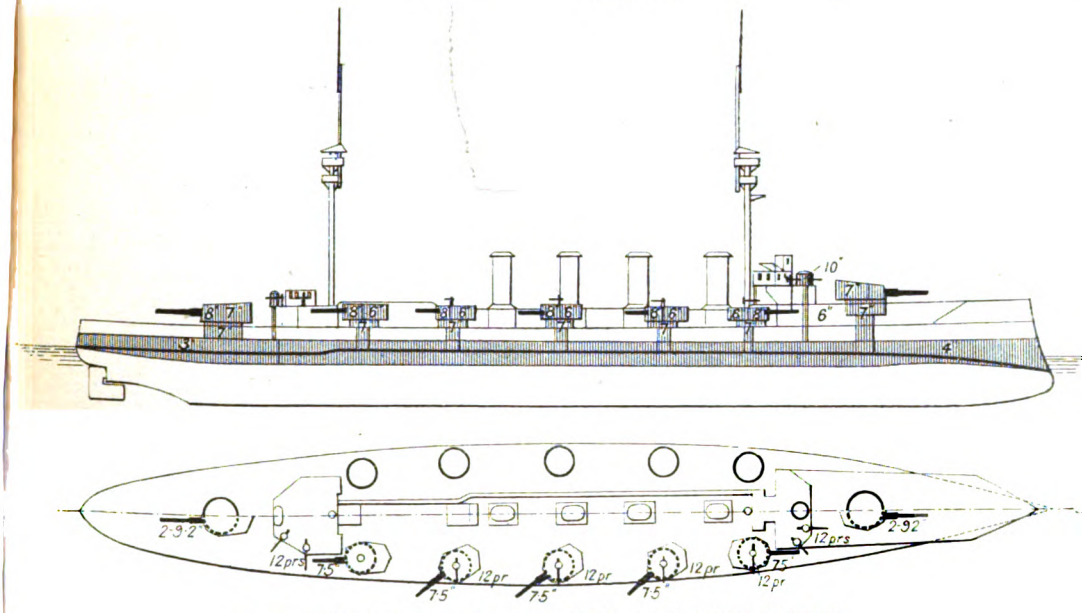
GREAT BRITAIN.

ARMOURED CRUISERS.

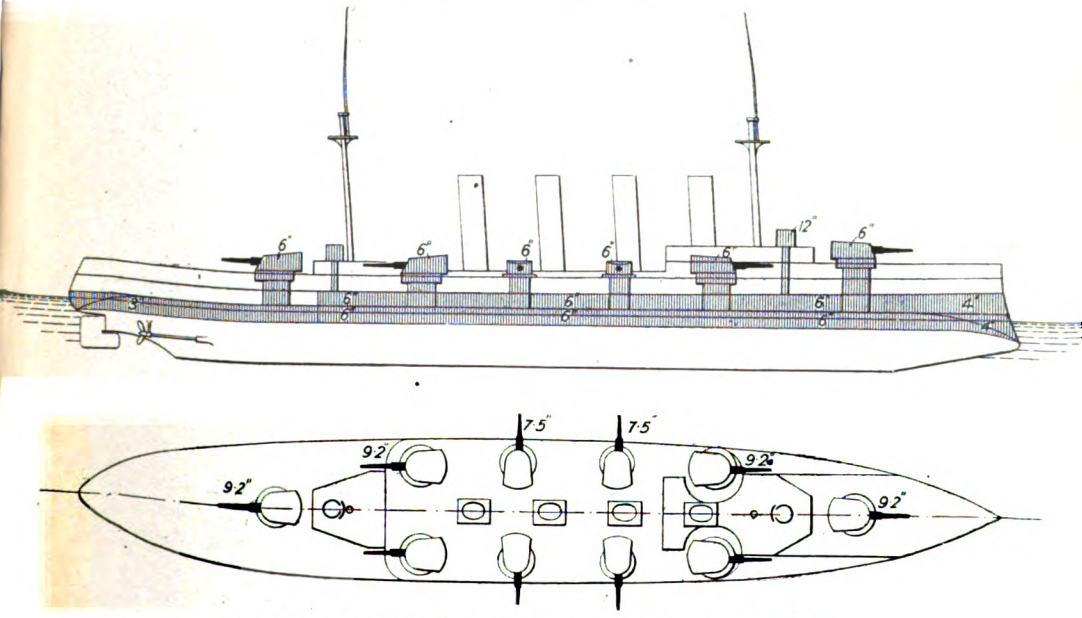
Minotaur. **Shannon.**



Length, 490 ft. ; 14,600 tons ; Speed, 22·5–23·5 knots ; Completed, 1908–1909 ;
Armament, 4—9·2 in., 10—7·5 in., 16—12 pr., 5 small.

See pages 277, 278.

Achilles. **Cochrane.**



Length, 480 ft. ; 13,550 tons ; Speed, 22·3–23·3 knots ; Completed, 1906–1907 ;
Armament, 6—9·2 in., 4—7·5 in., 24—3 pr., 2 small.

See page 274, 275.

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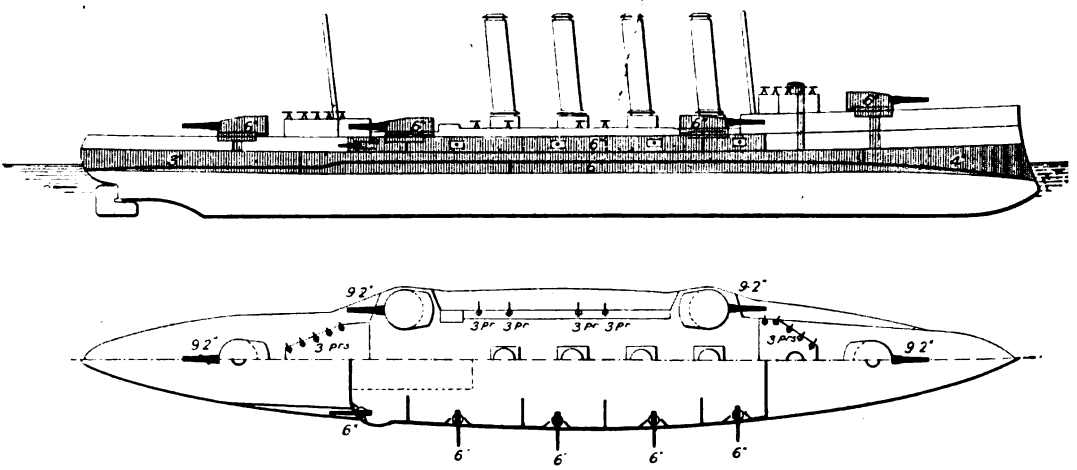
GREAT BRITAIN.

ARMOURED CRUISERS.

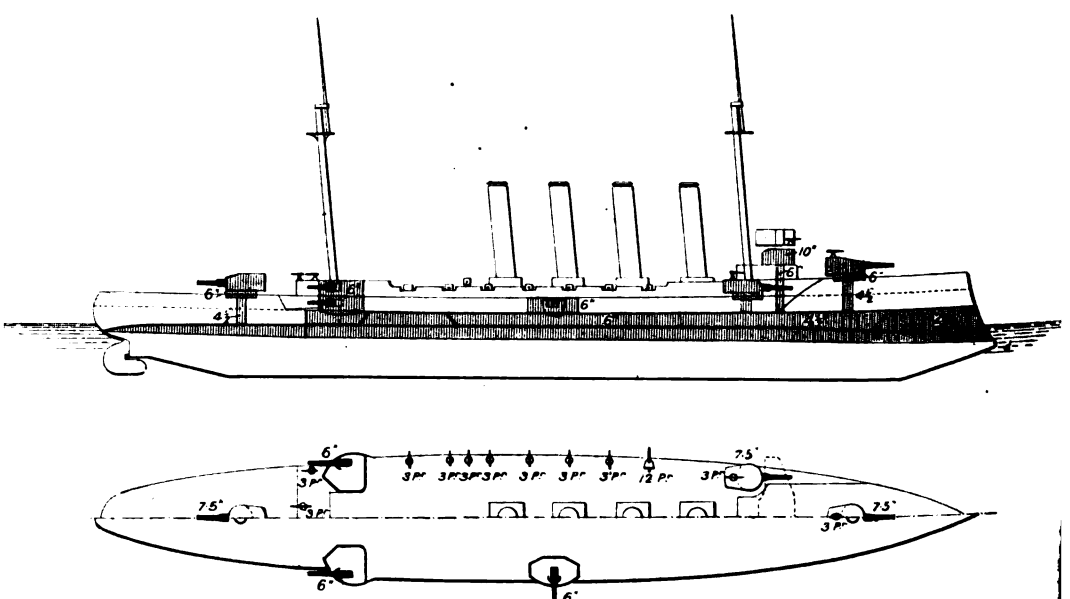
Duke of Edinburgh.



Length, 480 ft. ; 13,550 tons ; Speed, 22·8–23·6 knots ; Completed, 1906 ;
Armament, 6—9·2 in., 10—6 in., 20—3 pr., 2 small.
(See Note, p. 279.)

See page 275.

Devonshire. Antrim. Carnarvon. Roxburgh.



Length, 450 ft. ; 10,850 tons ; Speed, 22·2–23·6 knots ; Completed, 1905–1906 ;
Armament, 4—7·5 in., 9—6 in., 20—3 pr., 2 small.

See pages 274, 275, 278.

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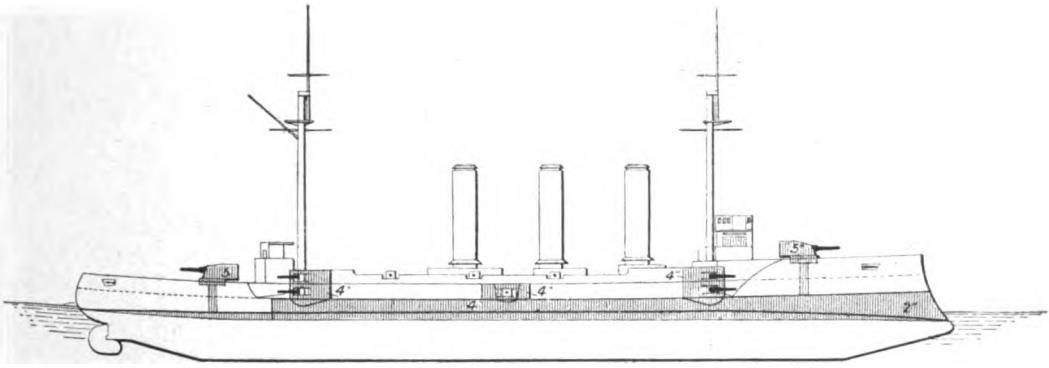
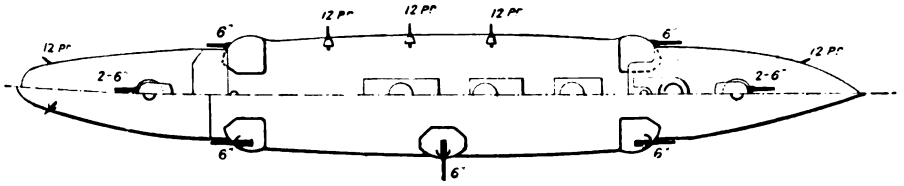
ARMOURED CRUISERS.

Berwick. Cornwall. Cumberland. Donegal. Essex.
Kent. Lancaster. Suffolk.





Length, 440 ft. ; 9800 tons ; Speed, 22·7–24·7 knots ; Completed, 1903–1905 ;
Armament, 14—6 in., 8—12 pr., 3—3 pr., 9 small.

See pages 274, 275, 276, 277, 278.

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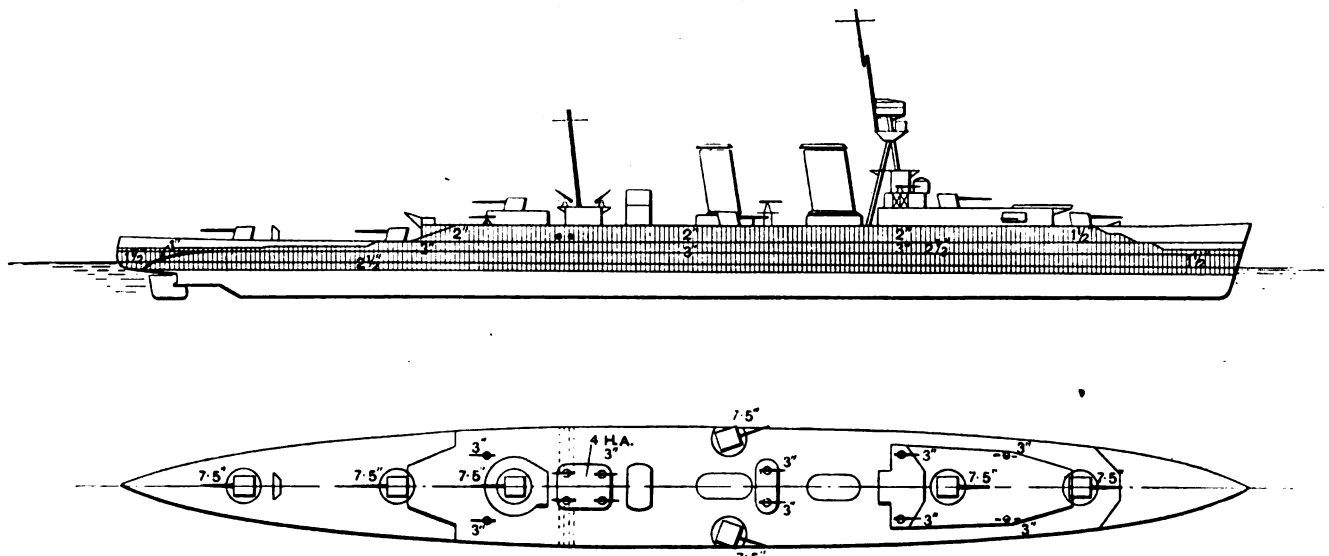
GREAT BRITAIN.

LIGHT CRUISERS.

Raleigh. **Effingham.** **Hawkins.** **Frobisher.**



Length, 565 ft.; 9750 tons; Speed, 30¼ knots;
Armament, 7—7·5 in., 12—3 in.

See page 286.

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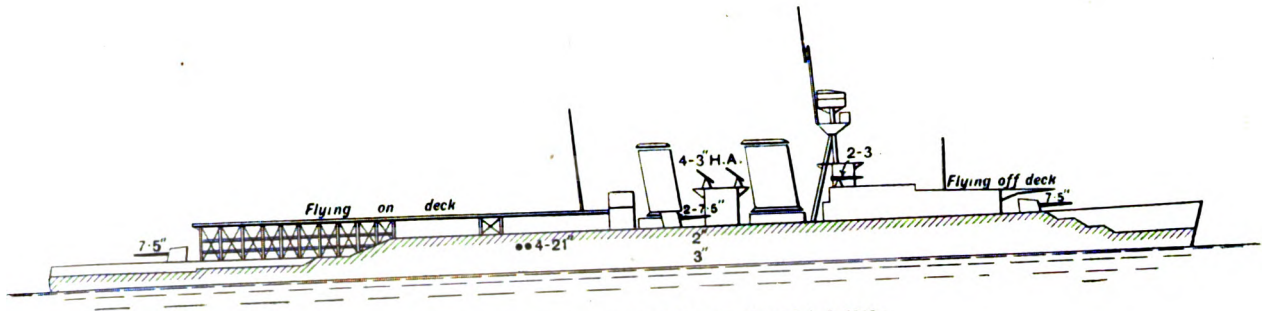
GREAT BRITAIN.

LIGHT CRUISER.

Vindictive.

Airplane Carrier.



Length, 565 ft. ; 9750 tons ; Speed, 30 knots ; Completed, 1918 ;
Armament, 4—7·5 in., 6—3 in.

See page 286.

PLATE 21.

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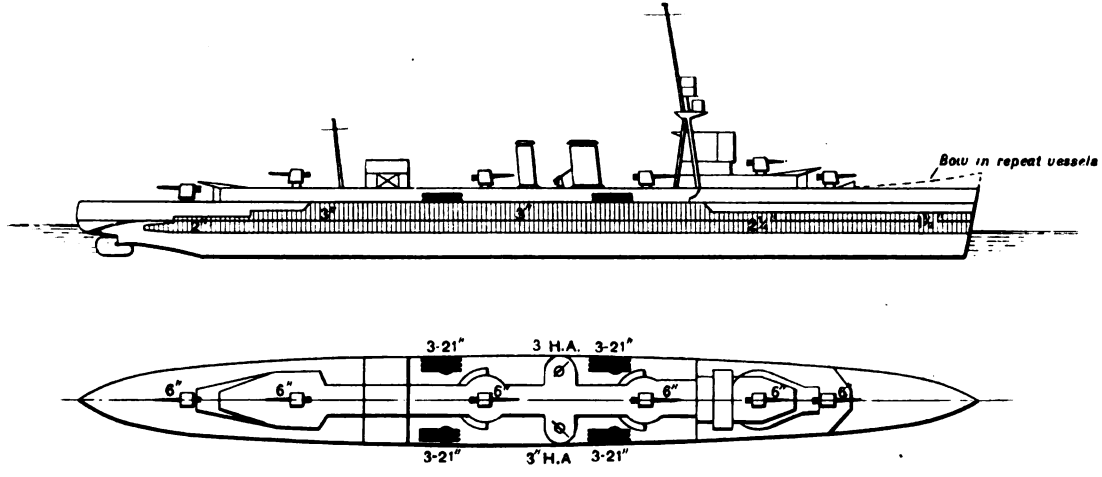
GREAT BRITAIN.

LIGHT CRUISERS. D CLASS.

Daedalus. **Daring.** **Despatch.** **Diomede.** **Dryad.** **Danae.** **Dauntless.**
Dragon. **Delhi.** **Dunedin.** **Durban.**



Length, 445 ft. ; 4650 tons ; Speed, 29 knots ;
Armament, 6—6 in., 2—3-in. H.A.

See page 285.

PLATE 22.

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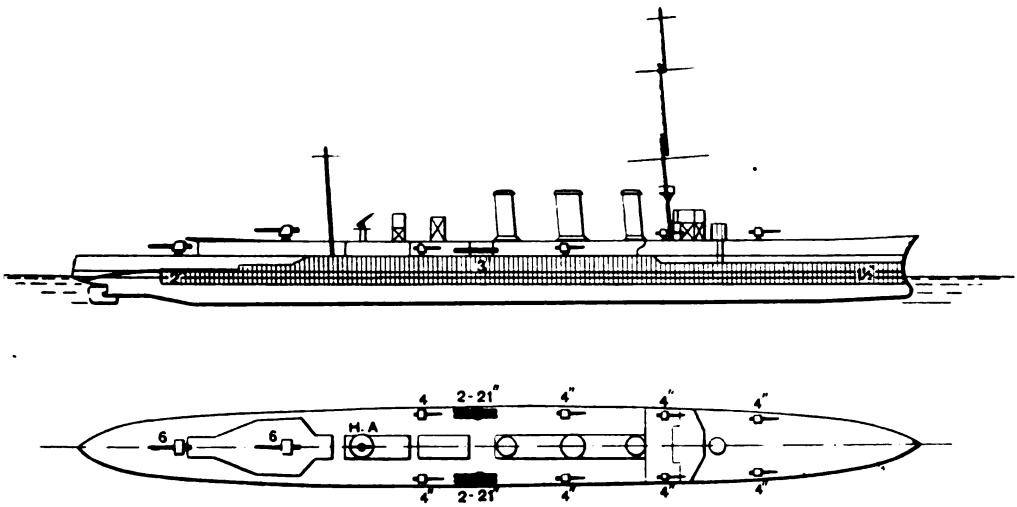
GREAT BRITAIN.

LIGHT CRUISERS C CLASS (as originally built).



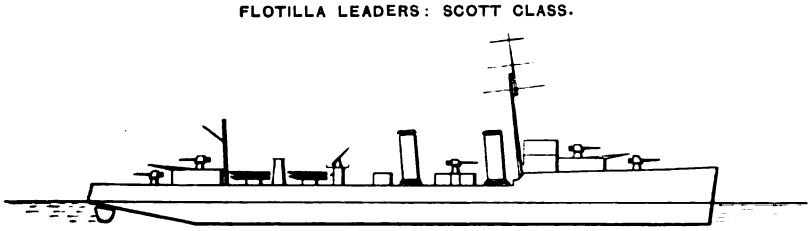
Length, 420 ft.; 3750 tons; Speed, 29 knots;
Armament, 2—6 in.; 8—4-in.; 1 H.A.

Calliope Conquest Cordelia Carysfort Cleopatra Comus Caroline	3 funnels	Conning tower and foremast removed since completion and tripod foremast added.	Centaur Concord Caledon Calypso Cassandra Caradoc	2 funnels	5—6-in. guns, all on centre-line, 2—3-in. H.A.
		6-in. gun added on centre-line forward in lieu of 2—4-in.	Ceres Curacoa Curlew Cardiff Coventry Cairo Capetown Carlisle Colombo Calcutta	2 funnels	5—6-in. guns on centre-line, arranged as in D class, i.e., end guns superimposed, 2—3-in. H.A.
Champion Cambrian Canterbury Castor Constance	2 funnels	6-in. gun added on centre-line amidships in lieu of 4—4-in. guns at waist.			

NOTE.—Some C class cruisers have submerged tubes only and no above-water tubes.

See pages 283, 284, 285.

FLOTILLA LEADERS: SCOTT CLASS.



Length, 320 ft.; 1800 tons; Speed, 36 knots;
Armament, 5—4·7 in.; 1—3-in. A.A.

See page 340.

PLATE 23.

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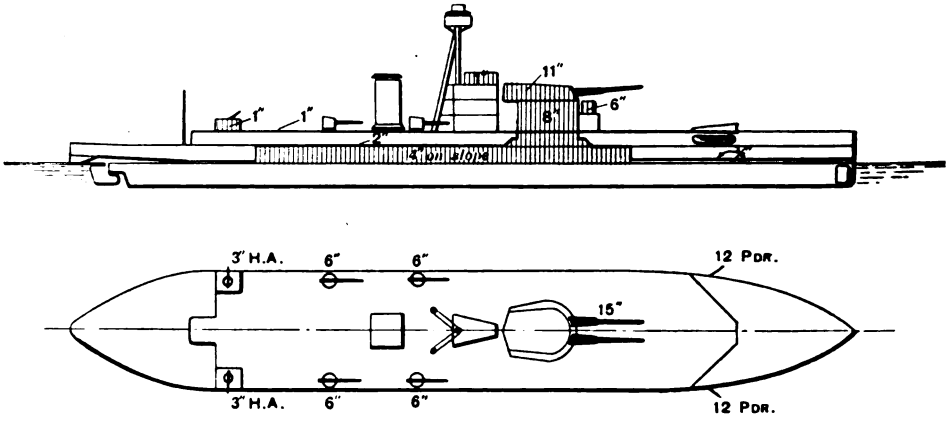
MONITORS.

Erebus. **Terror.**



Length, 380 ft. ; 8000 tons ; Speed, 12 knots ;
Armament, 2—15 in., 4—6 in., 2—12 pr., 2—3-in. H.A.

See page 281.

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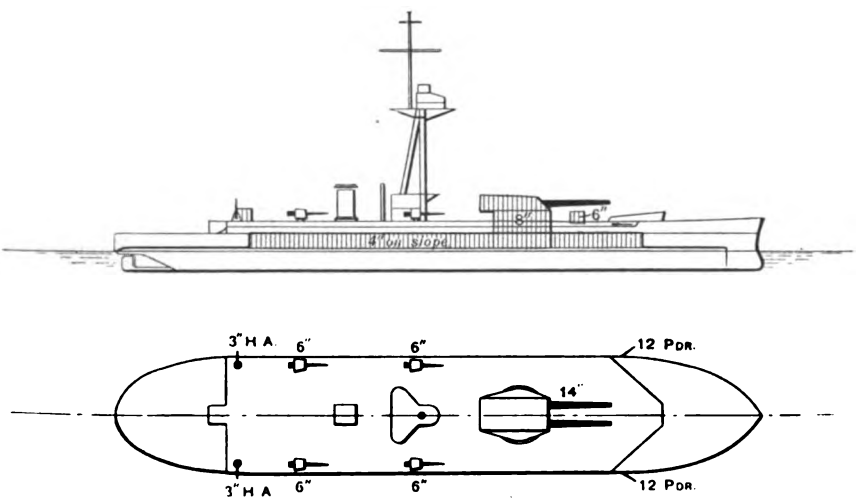
GREAT BRITAIN.

LARGE GUN MONITORS.



Length, 320—340 ft.; 5000—6500 tons; Speed, 6—7 knots;
Armament, 2—12, 14, or 15 in., 4—6 in., or 8—4 in., 2—3 in. H.A.

See pages 280, 281.

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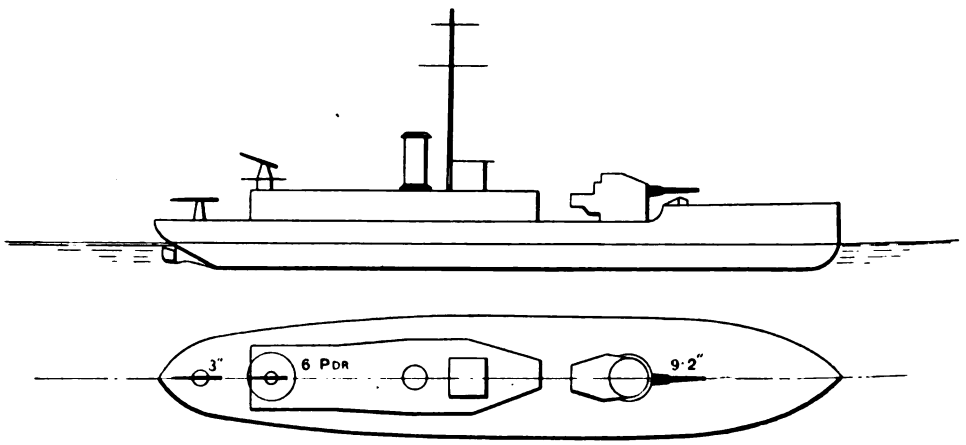
GREAT BRITAIN.

9·2 IN. MONITORS. M. 15–28.

50 40 30 20 10 0 50 100

Scale 1" = 50 ft



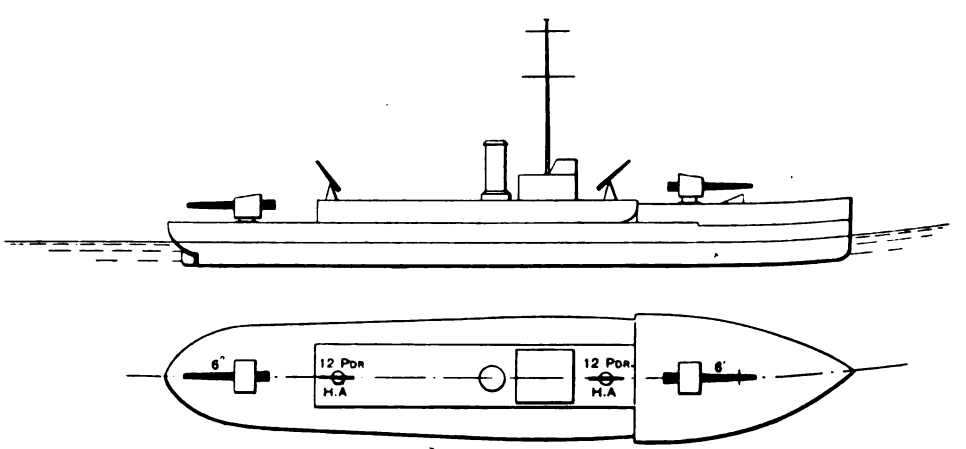
Length, 170 ft. ; 540 tons ; Speed, 12-13 knots ;
Armament, 1—9·2 in., 1—3 in., 1—6 pr.

See page 280.

6 IN. MONITOR. M. 29–33.

50 40 30 20 10 0 50 100

Scale 1" = 50 ft



Length, 170 ft. ; 355 tons ; Speed, 10 knots ;
Armament, 2—6 in., 2—12-pr. H.A.

See page 281.

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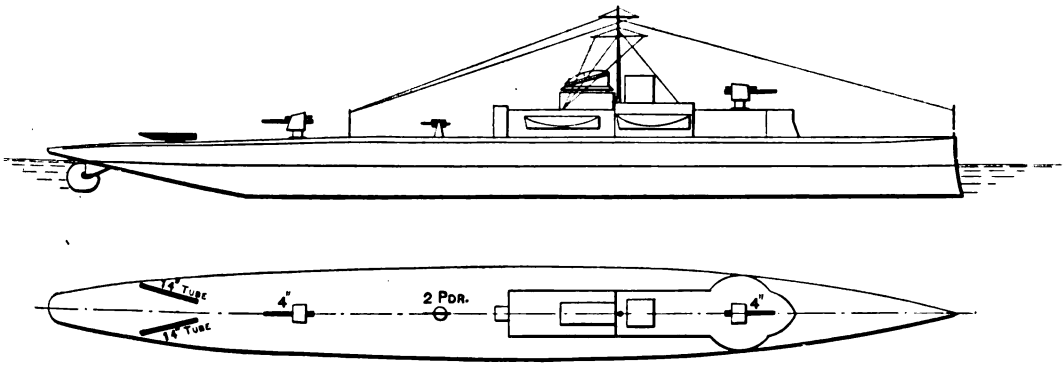
GREAT BRITAIN.

PATROL VESSELS: P CLASS.

Scale 1" = 50 ft.

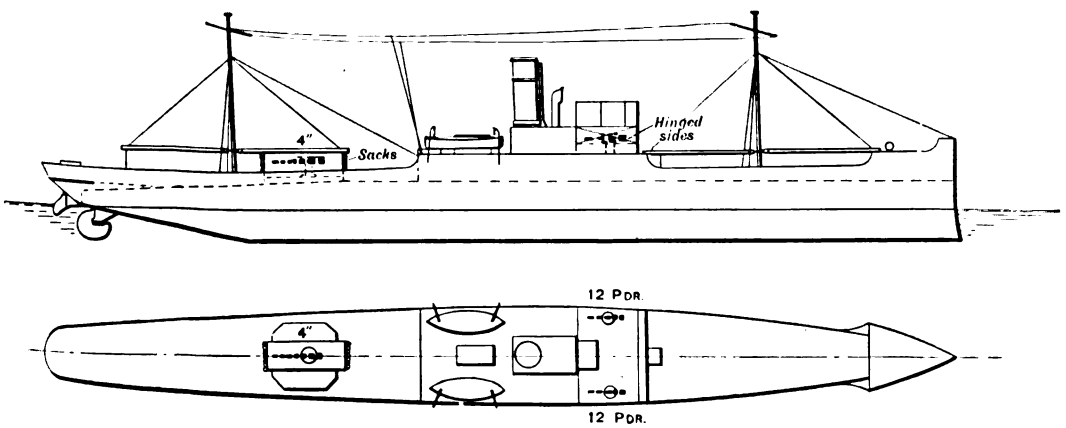


Length, 230 ft. ; 573 tons ; Speed, 22 knots ;
Armament, 2—4 in., 1—2 pr., 2—14-in. T.T.

See page 352.

CONVERTED PATROL VESSELS: PC CLASS.

Scale 1 = 50 ft.



Length, 230 ft. ; 682 tons ; Speed, 20·5 knots ;
Armament, 1—4 in., 2—12 pr., 4—14-in. T.T.

See page 352.

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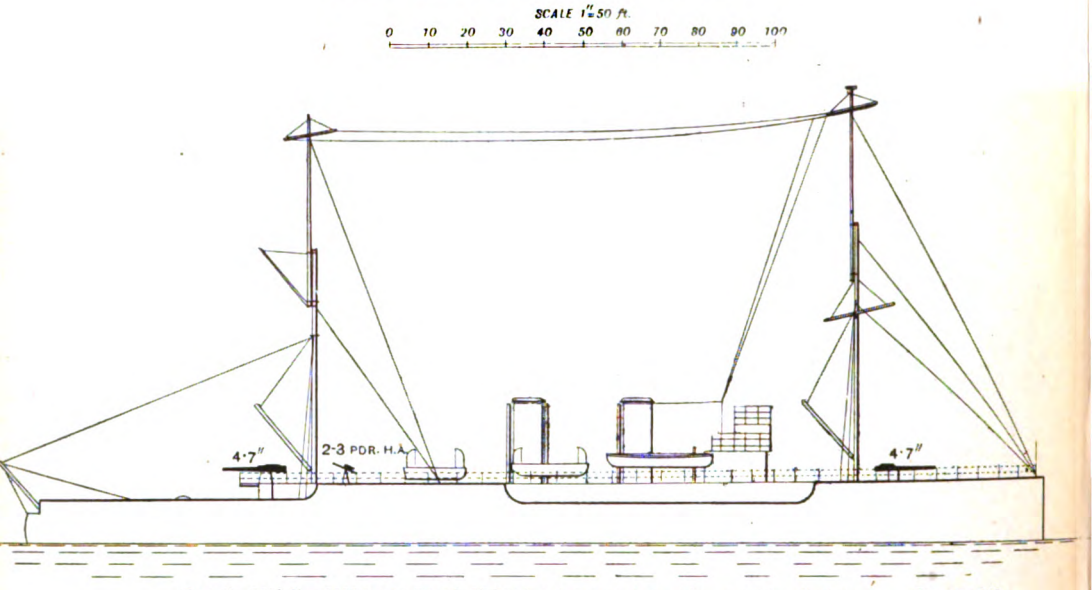
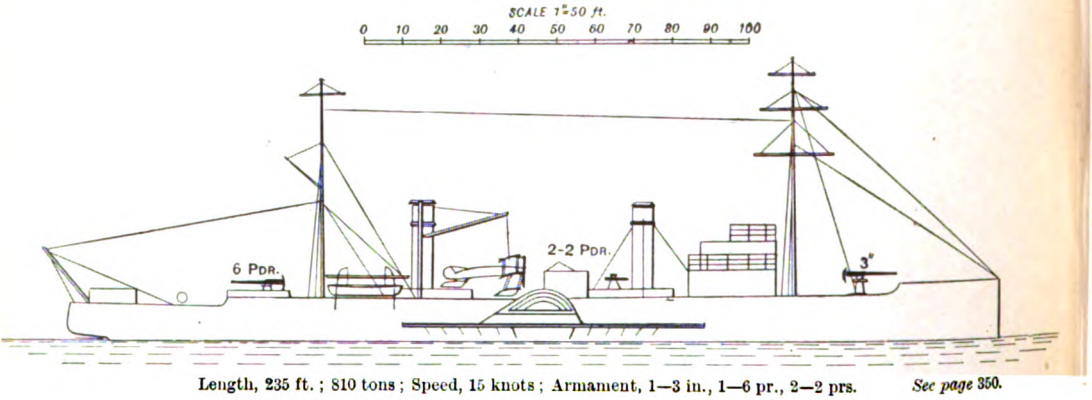
GREAT BRITAIN.

SINGLE SCREW SLOOPS. FLOWER CLASS.



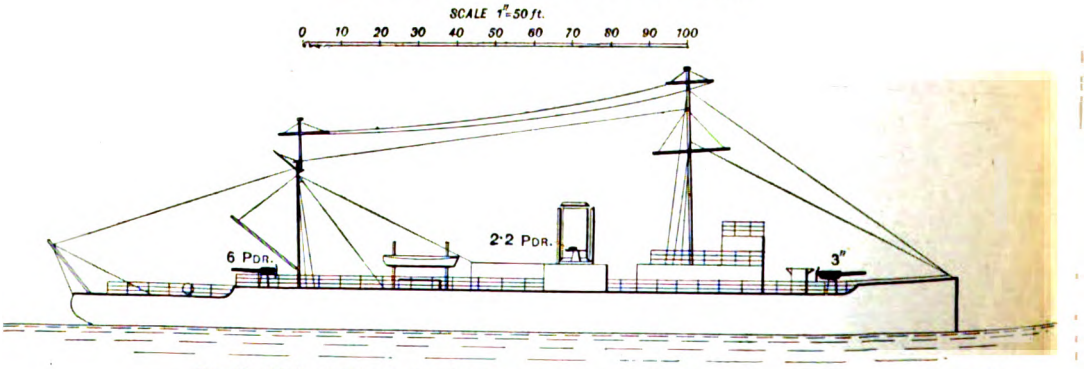
Length, 255½ ft.; 1250 tons; Speed, 17 knots; Armament, 2—4 in. or 4·7 in., 2—3 prs. *See page* 349.

PADDLE MINE-SWEEPERS. ASCOT CLASS.



Length, 235 ft.; 810 tons; Speed, 15 knots; Armament, 1—3 in., 1—6 pr., 2—2 prs. *See page* 350.

TWIN SCREW MINE-SWEEPERS. HUNT CLASS.



Length, 220 ft.; 750 tons; Speed, 16 knots; Armament, 1—3 in., 1—6 pr., 2—2 prs. *See page* 351.

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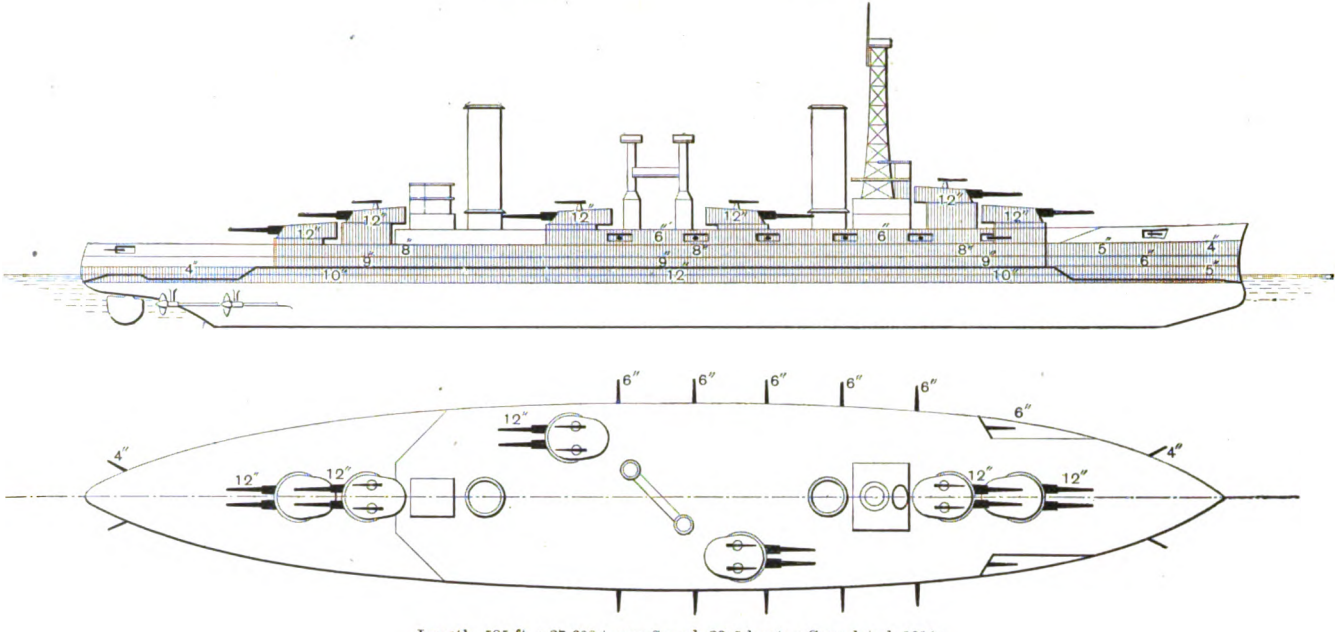
ARGENTINE.

BATTLESHIPS.

Moreno. **Rivadavia.**



Length, 585 ft. ; 27,600 tons ; Speed, 22·5 knots ; Completed, 1914 ;
Armament, 12—12 in., 12—6 in., 16—4 in., 10 small.

See page 289.

PLATE 29.

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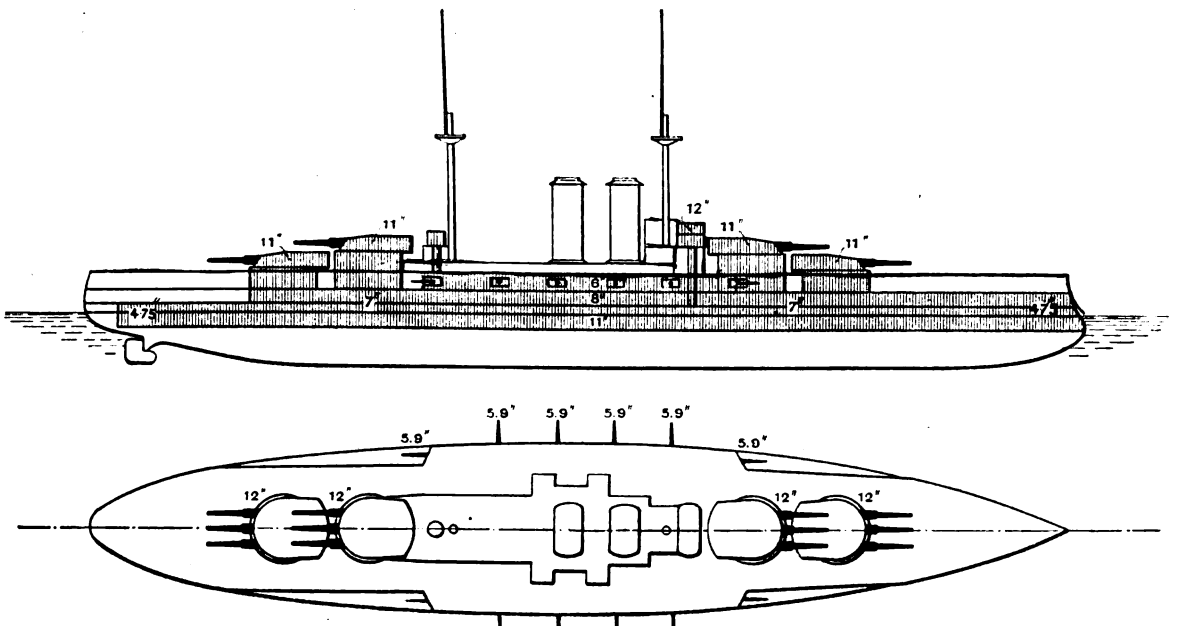
FORMER AUSTRIAN SHIPS.

BATTLESHIPS.

Prinz Eugen. **Tegetthoff.**



Length, 495 ft. ; 20,000 tons ; Speed, 20·7 knots ; Completed 1913 and Building ;
Armament, 12—12 in., 12—5·9 in., 18—12 pr., 6 small.

The Szent Istvan, torpedoed, 10th June, and Viribus Unitis, sunk at Pola, 1st November, 1918, belonged to this class.

See page 291.

PLATE 30.

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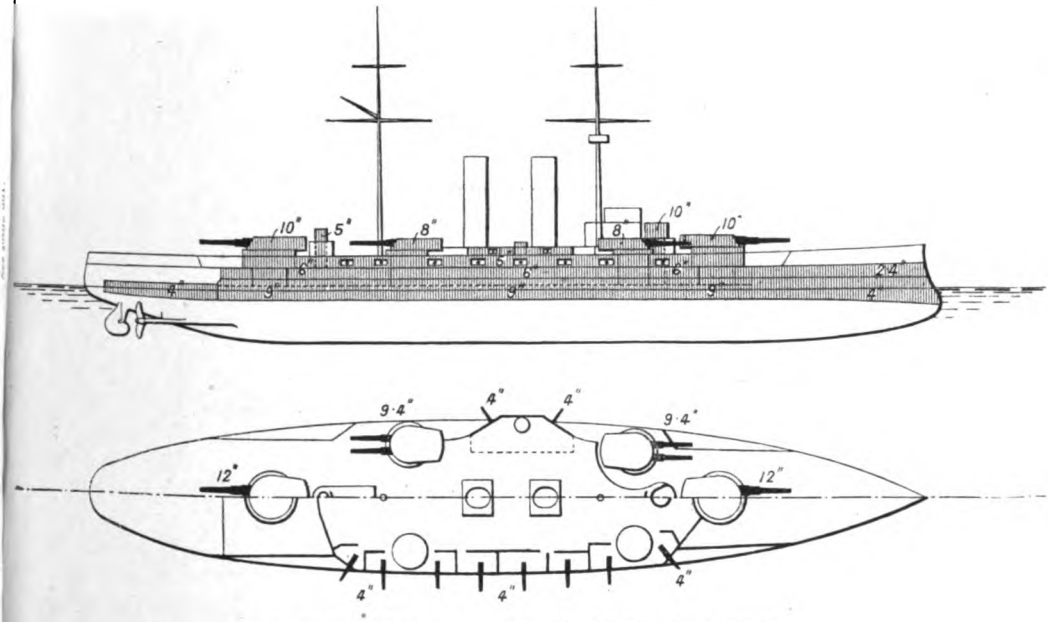
FORMER AUSTRIAN SHIPS.

BATTLESHIPS.

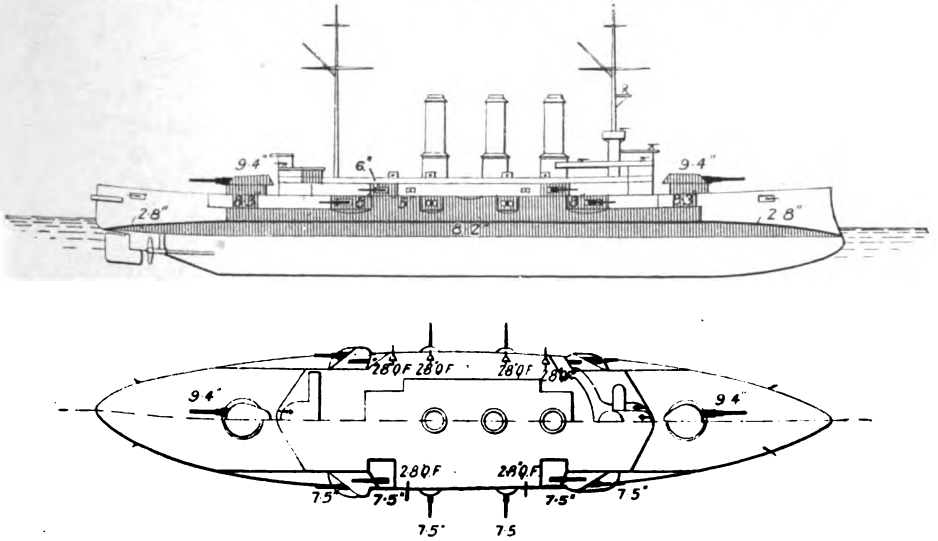
Erzherzog Franz Ferdinand. **Radetzky.** **Zrinyi.**



Length, 451 ft. ; 14,226 tons ; Speed, 20·5 knots ; Completed, 1910–1911 ;
Armament, 4—12 in., 8—9·4 in., 20—3·9 in., 6—12 pr., 2 small.

See page 291.

Erzherzog Ferdinand Max. **Erzherzog Karl.** **Erzherzog Friedrich.**



Length, 390 ft. ; 10,433 tons ; Speed, 20 knots ; Completed, 1905–1907 ;
Armament, 4—9·4 in., 12—7·5 in., 12—2·8 in., 16 small.

See page 291.

PLATE 31.

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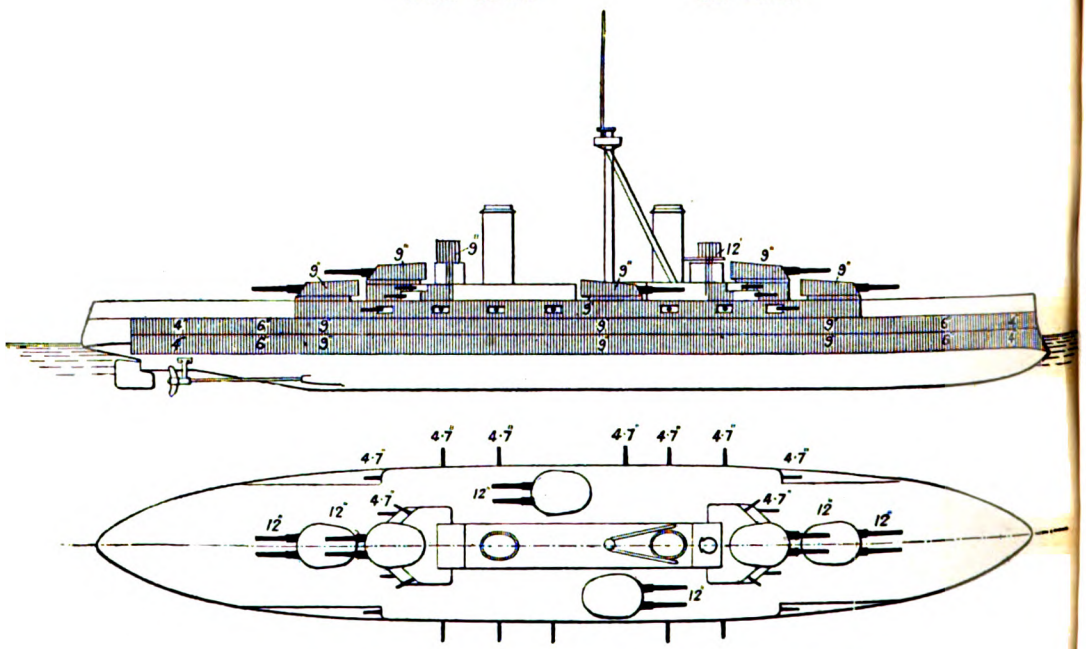
BRAZIL.

BATTLESHIPS.

Minas Geraes. **Sao Paulo.**



Length, 500 ft. ; 19,281 tons ; Speed, 21 knots ; Completed, 1909, 1910 ;
Armament, 12—12 in., 22—4·7 in., 8 small.

See page 203.

PLATE 32.

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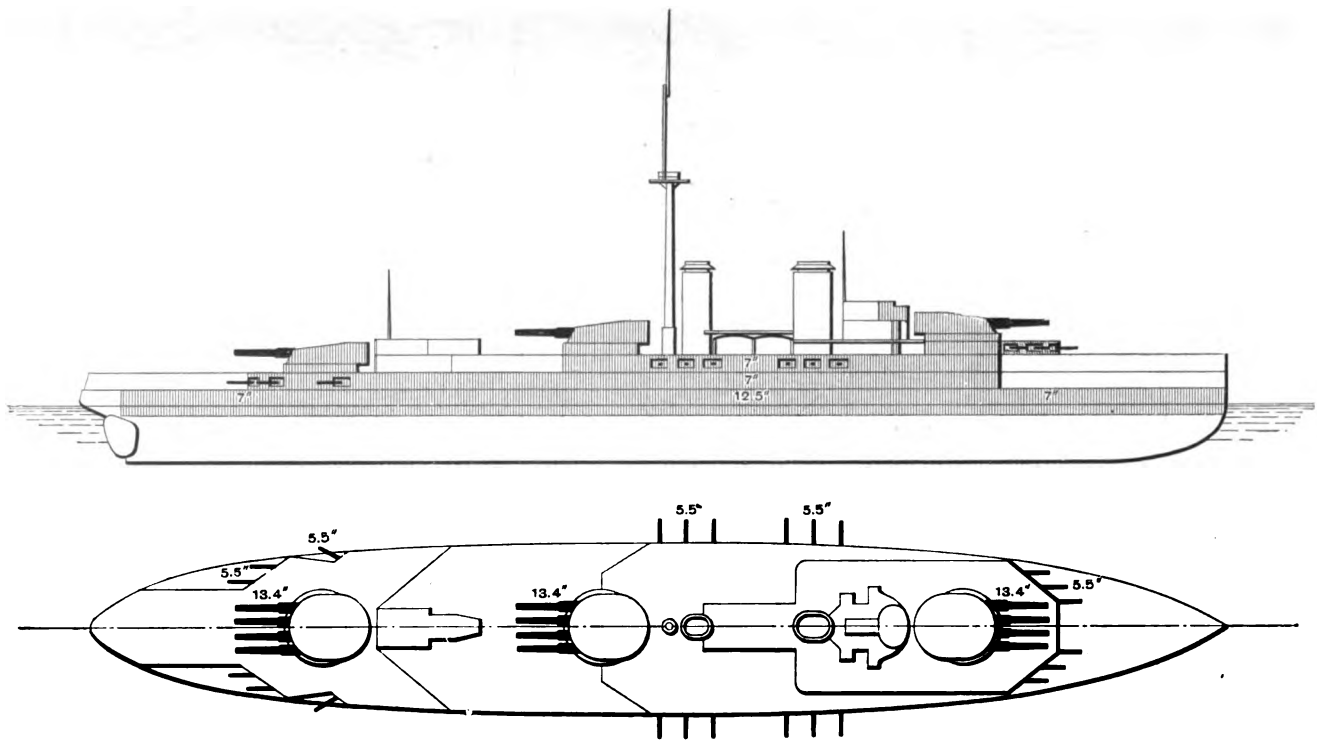
BATTLESHIPS.

Normandie. Flandre. Gascogne. Languedoc. Béarn.



Length, 574 ft.; 25,230 tons; Speed, 21 knots; Building (work suspended);
Armament, 12—13·4 in., 24—5·5 in., 4—3 pr.

See pages 298, 290, 300.

PLATE 33.
d 2

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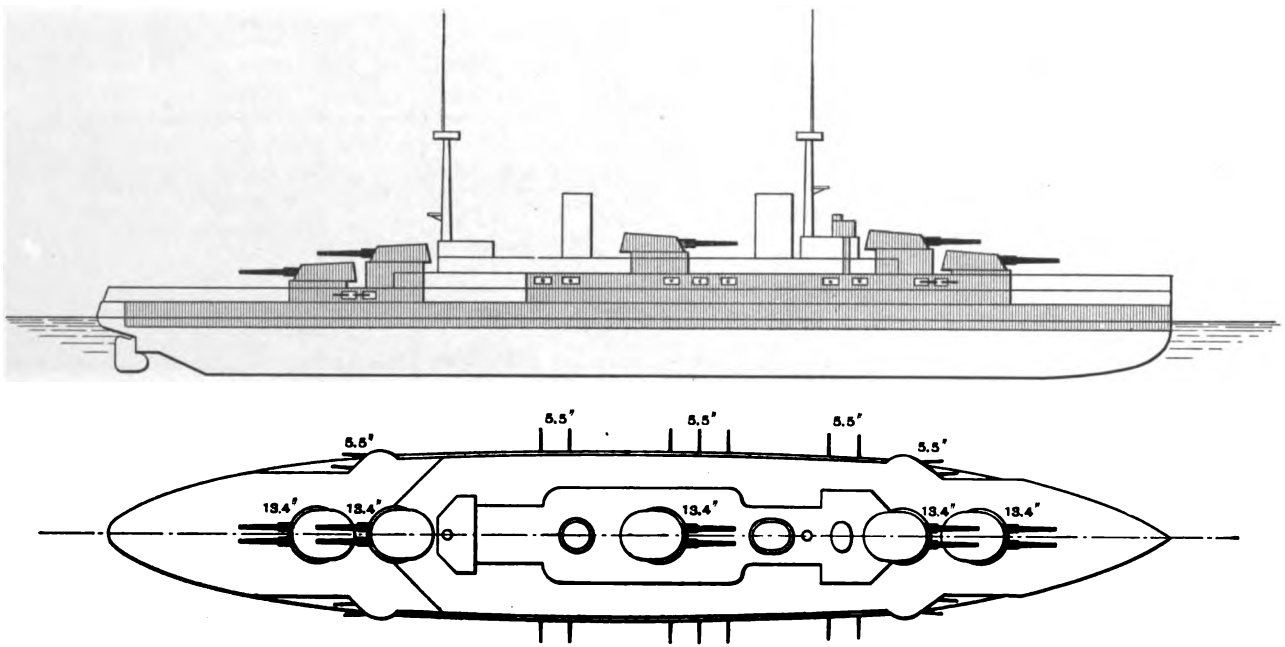
FRANCE.

BATTLESHIPS.

Bretagne. **Provence.** **Lorraine.**



Length, 546 ft. ; 23,177 tons ; Speed, 20 knots ;
Armament, 10—13·4 in., 22—5·5 in., 8 small.

See pages 298, 300, 301.

PLATE 34.

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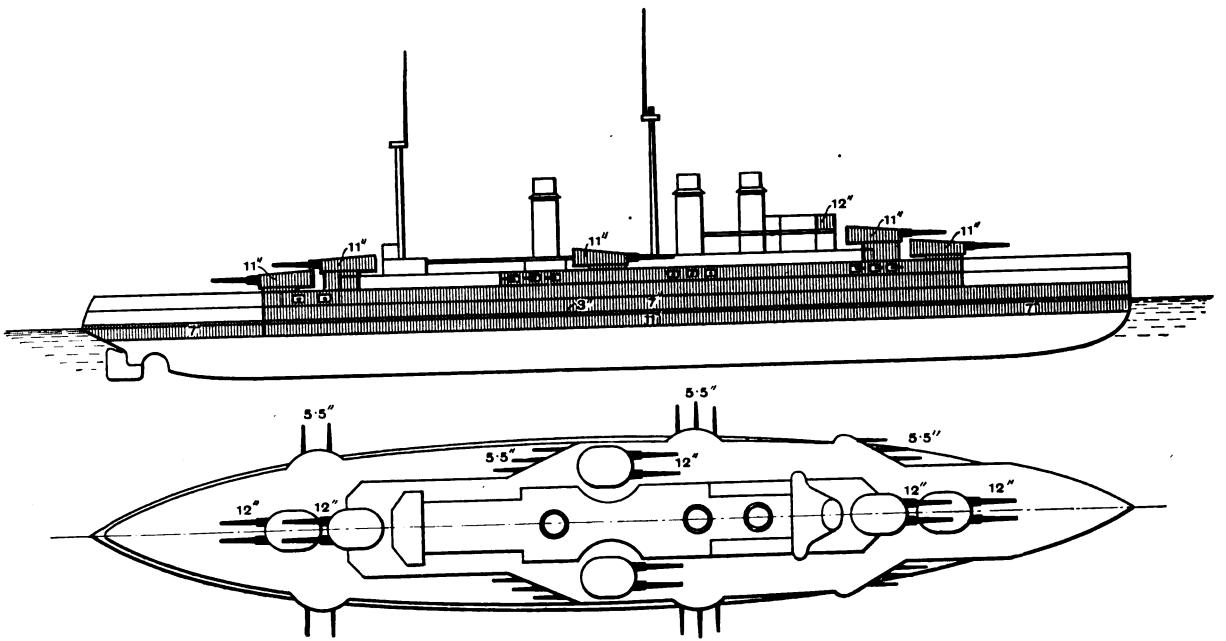
FRANCE.

BATTLESHIPS.

Jean Bart. Courbet. France. Paris.



Length, 546 ft.; 23,100 tons; Speed, 20 knots; Completed 1913–14;
Armament, 12—12 in., 22—5·5 in., 4—3 pr.

See pages 298, 299, 300.

PLATE 35.

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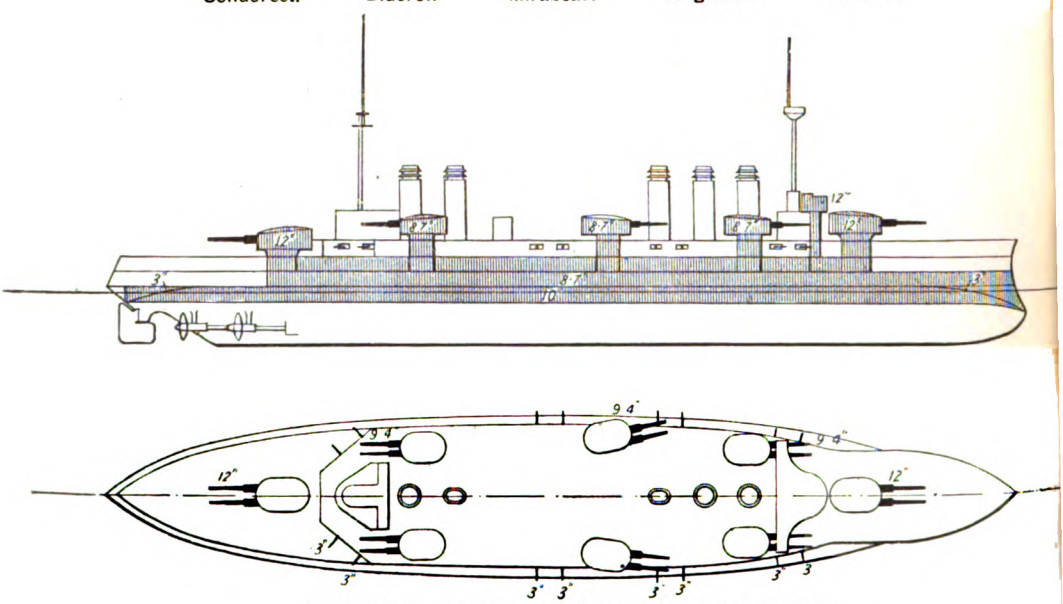
FRANCE.

BATTLESHIPS.

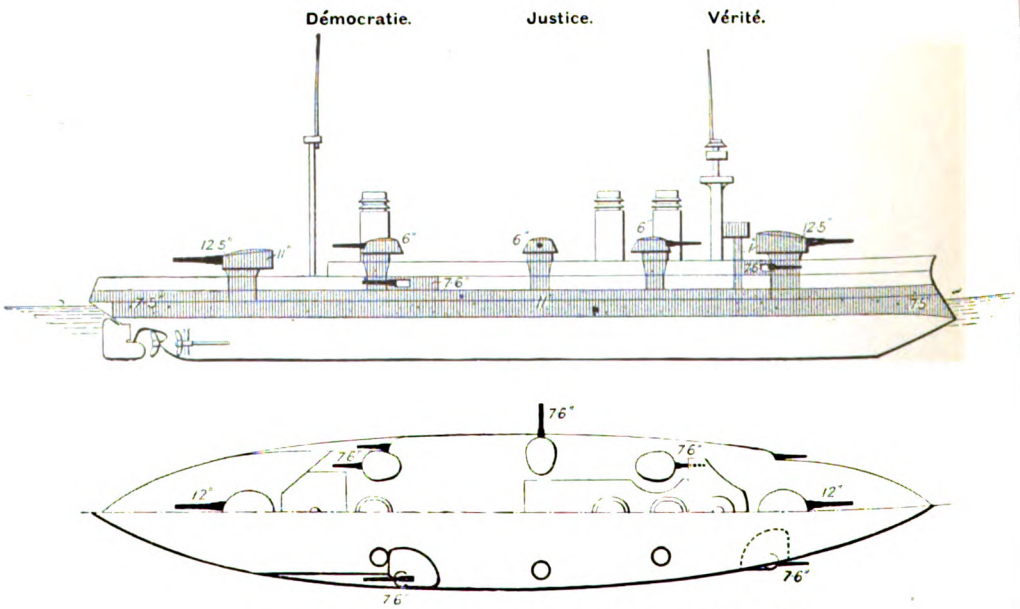
Condorcet. **Diderot.** **Mirabeau.** **Vergniaud.** **Voltaire.**



Length, 476 ft. ; 18,890 tons ; Speed, 19·5 knots ; Completed, 1911 ;
Armament, 4—12 in., 12—9·4 in., 16—12 pr., 10 small.

See pages 298, 300, 301.

Démocratie. **Justice.** **Vérité.**



Length, 439 ft. ; 14,635 tons ; Speed, 19 knots ; Completed, 1907–1908 ;
Armament, 4—12 in., 10—7·6 in., 28 small.

See pages 298, 300, 301.

PLATE 36.

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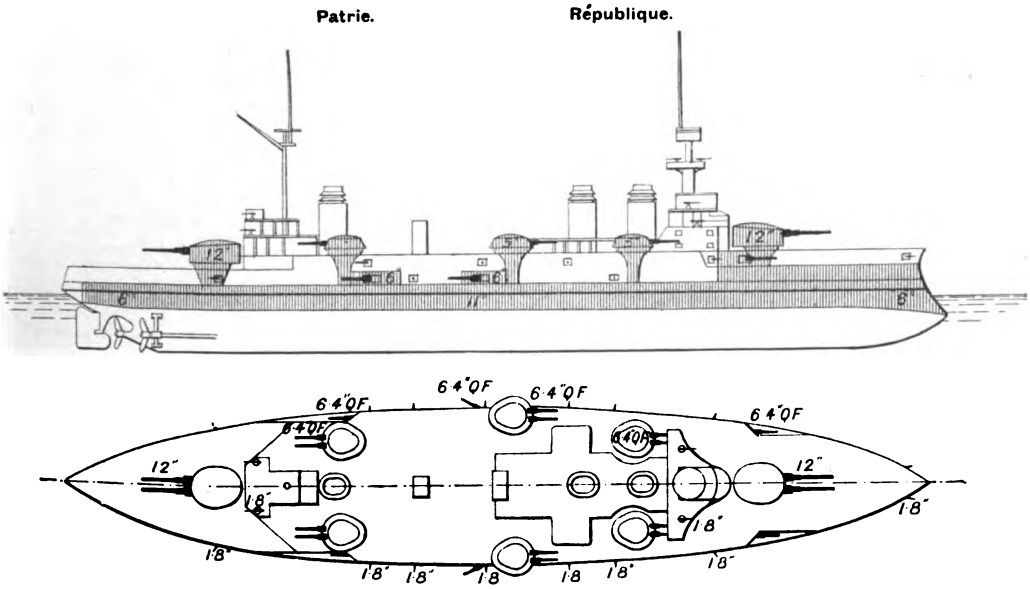
FRANCE.

BATTLESHIPS.

Patrie. **République.**


12
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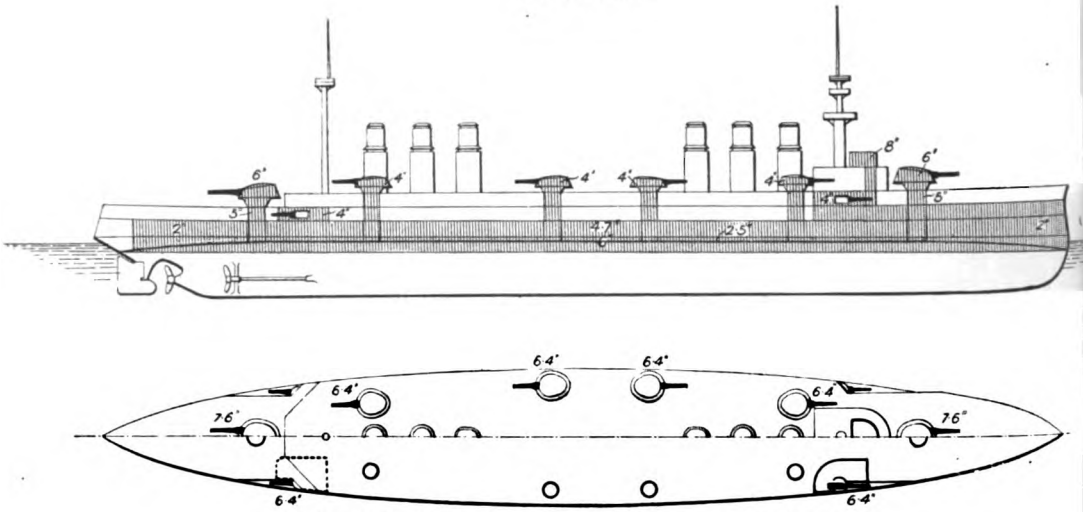
6

FRANCE.

ARMOURED CRUISERS.

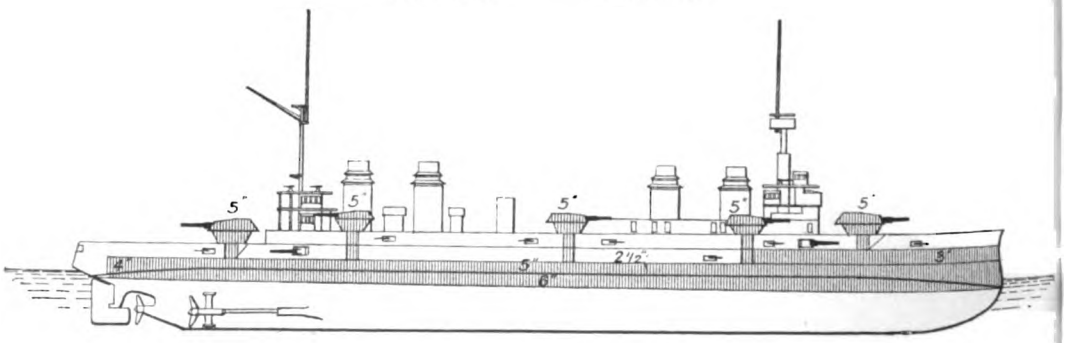
Ernest Renan.

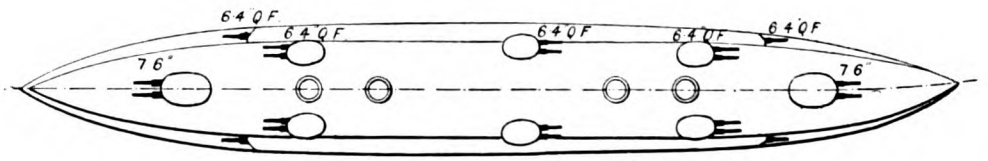


Length, 515 ft. ; 13,427 tons ; Speed, 25·5 knots ; Completed, 1909 ;
Armament, 4—7·6 in., 12—6·4 in., 24 small.

See page 299.

Jules Ferry. Victor Hugo.





Length, 480 ft. ; 12,351 tons ; Speed, 22·5 knots ; Completed 1904-1907 ;
Armament, 4—7·6 in., 16—6·4 in., 24 small.

See pages 299, 301.

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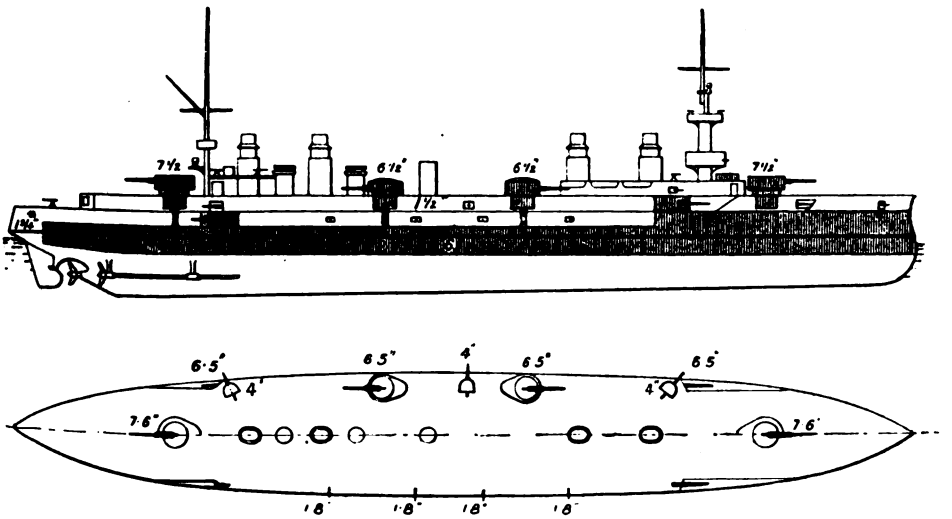
FRANCE.

ARMOURED CRUISERS.

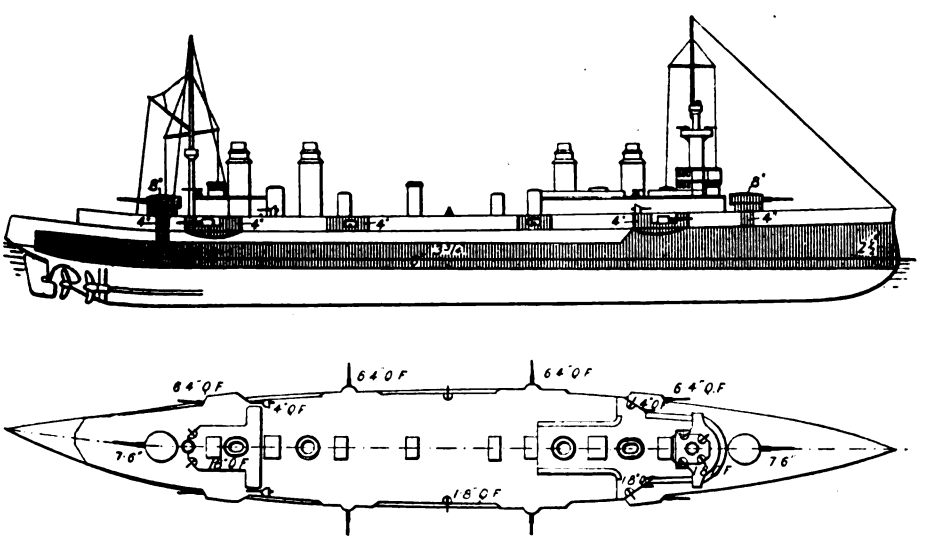
Amiral Aube. **Condé.** **Gloire.** **Marseillaise.**



Length, 453 ft.; 10,000 tons; Speed, 21 knots; Completed, 1903–1904;
Armament, 2—7·6 in., 8—6·4 in., 6—3·9 in., 20 small.

See pages 298, 299, 300.

Montcalm. **Gueydon.**



Length, 453 ft.; 9367 tons; Speed, 21 knots; Completed, 1902–1905;
Armament, 2—7·6 in., 8—6·4 in., 4—3·9 in.

See pages 299, 300

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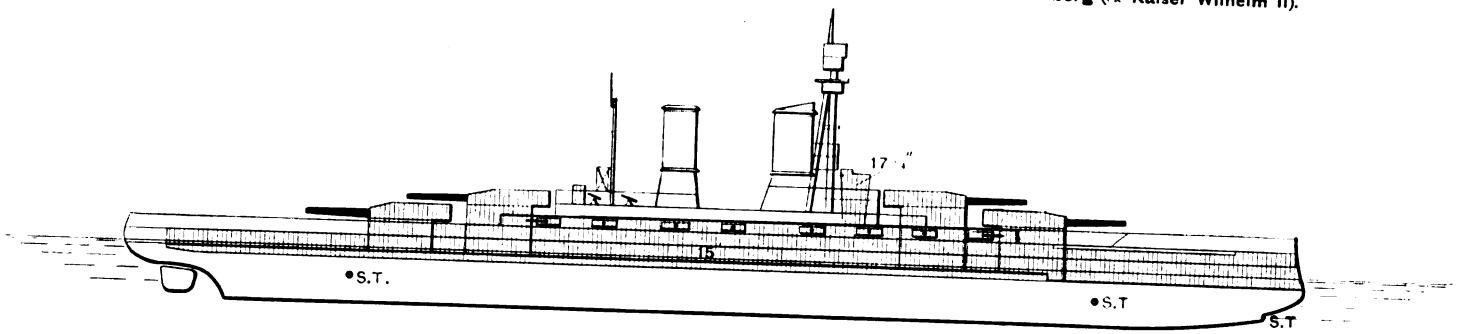
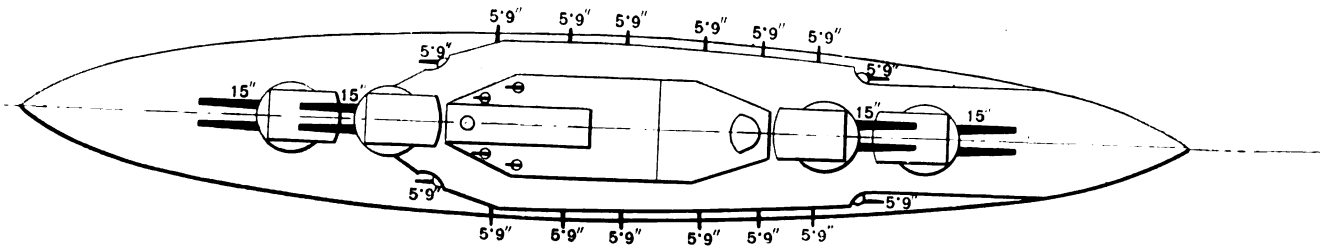
GERMANY.

BATTLESHIPS.

* (Completed vessels interned at Scapa Flow.)

Bayern (*ex* T).* **Baden** (*ex* Ersatz Wörth).* **Sachsen** (*ex* Kaiser Friedrich III). **Württemberg** (*ex* Kaiser Wilhelm II).





Length, L.W.L., 623¾ ft. ; 28,000 tons ; 22 knots ;
Armament, 8—15 in., 16—5·9 in., 4—3·4 in. A.A.

See pages 303, 305.

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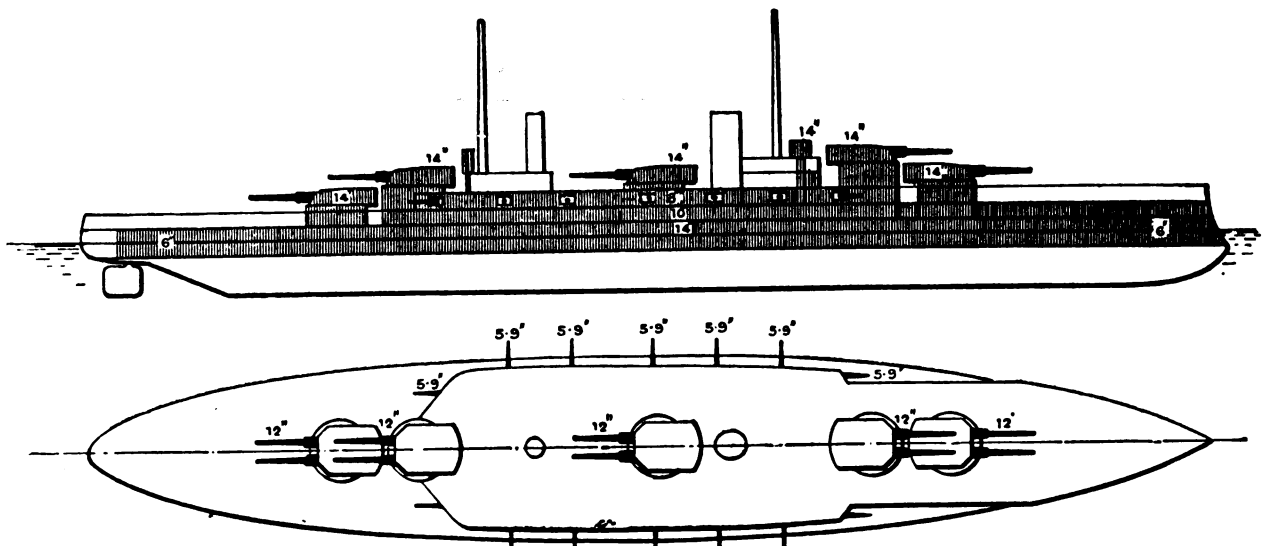
GERMANY.

BATTLESHIPS.

(Interned at Scapa Flow.)

König. Grosser Kurfürst. Markgraf. Kronprinz Wilhelm.



Length on W.L., 573½ ft.; 25,390 tons; Speed, 21 knots; Completed, 1914-15;
Armament, 10—12 in., 14—5·9 in., 4—3·4 in.

See pages 303, 304.

PLATE 41.

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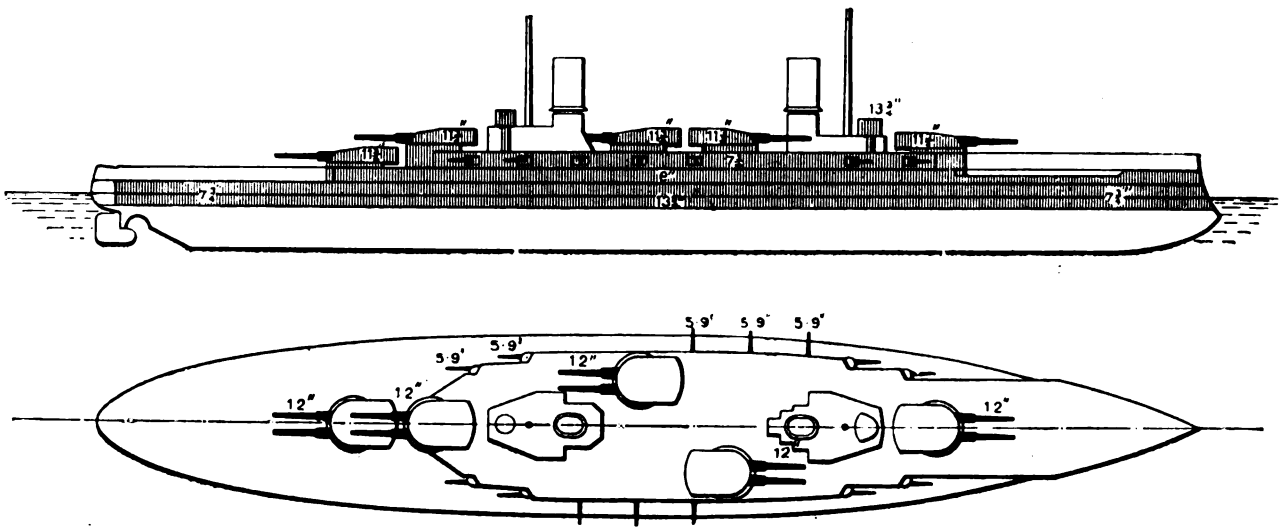
GERMANY.

BATTLESHIPS.

(Interned at Scapa Flow.)

Kaiser. **Friedrich der Grosse.** **Kaiserin.** **Prinzregent Luitpold.** **König Albert.**



Length on W.L., 564 ft.; 24,310 tons; Speed, 21 knots; Completed, 1912-13;
Armament, 10—12 in.; 14—5·9 in.; 2—3·4 in.

See pages 303, 304, 305.

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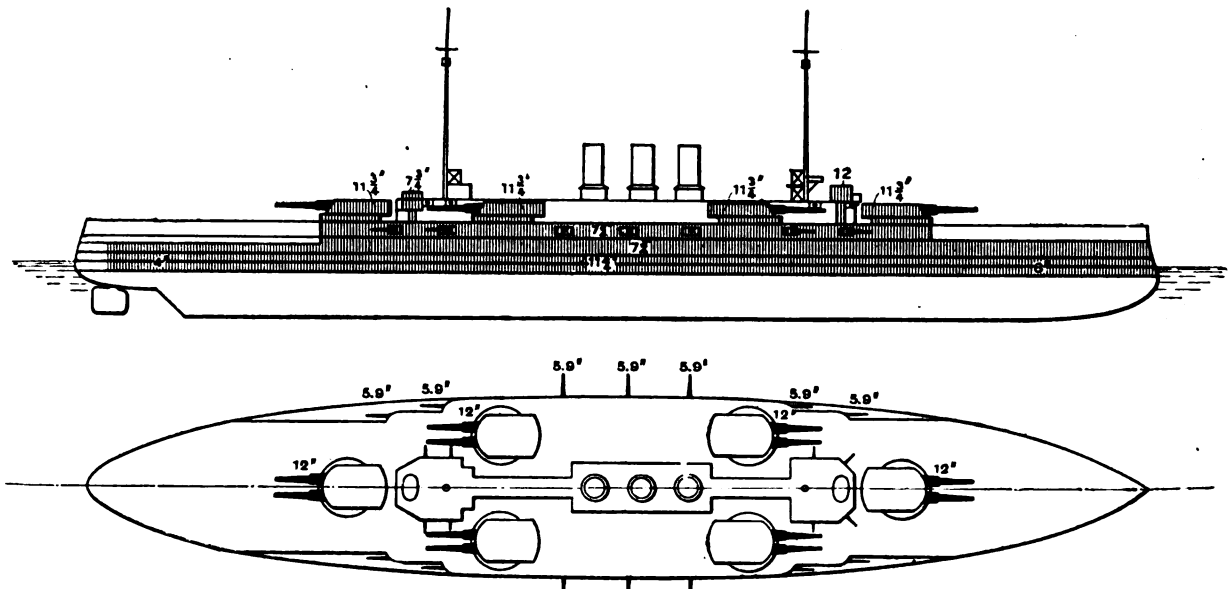
BATTLESHIPS TO BE SURRENDERED.

Ostfriesland. **Helgoland.** **Oldenburg.** **Thüringen.**



Length on W.L., 546 ft. ; 22,440 tons ; Speed, 20·5 knots ; Completed, 1911-12 ;
Armament, 12—12 in., 14—5·9 in., 2 or 4—3·4 in.

See pages 303, 304, 305.

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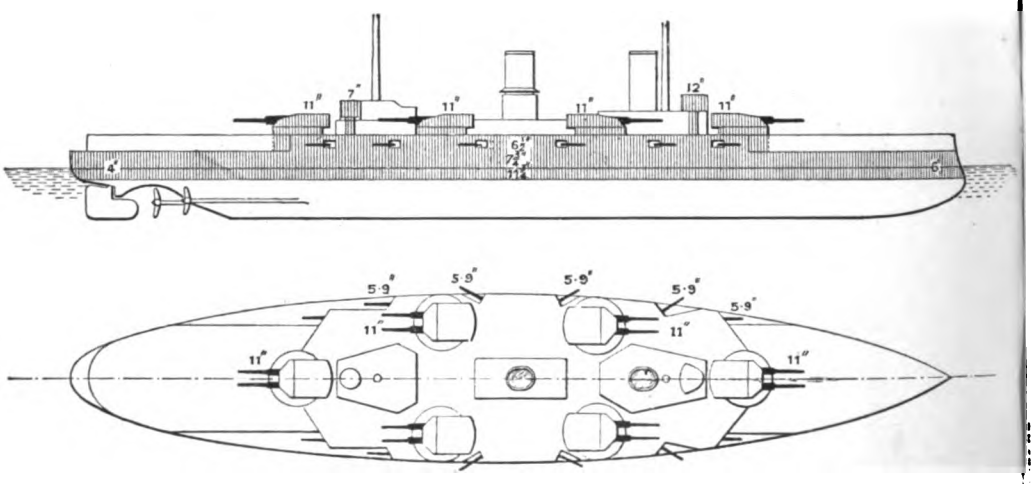
GERMANY.

BATTLESHIPS.

(To be dismantled in German ports.)

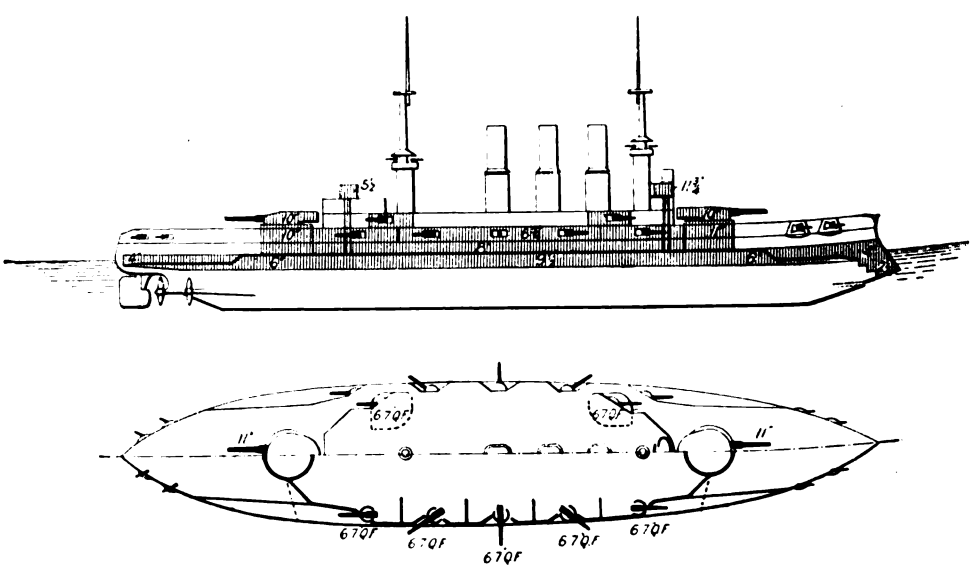
Nassau. **Posen.** **Rheinland.** **Westfalen.**



Length, L.W.L., 452 ft.; 18,600 tons; Speed, 20 knots; Completed, 1909-1910;
Armament, 12—11 in., 12—5·9 in., 2 or 4—3·4 in.

See pages 304, 305.

Deutschland. **Hannover.** **Schlesien.** **Schleswig-Holstein.**



Length, B.P., 398½ ft.; 13,040 tons; Speed, 19 knots; Completed, 1906-1908;
Armament, 4—11 in., 14—6·7 in., 2—3·4 in., 2 M.

See pages 303, 305.

PLATE 44.

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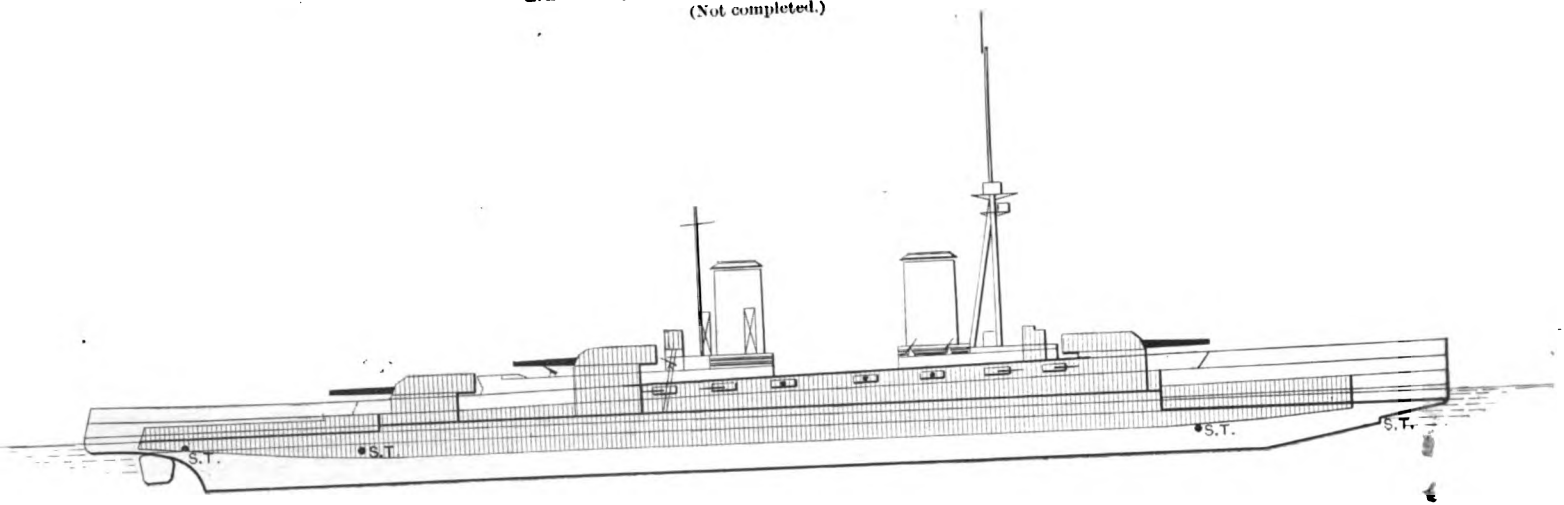
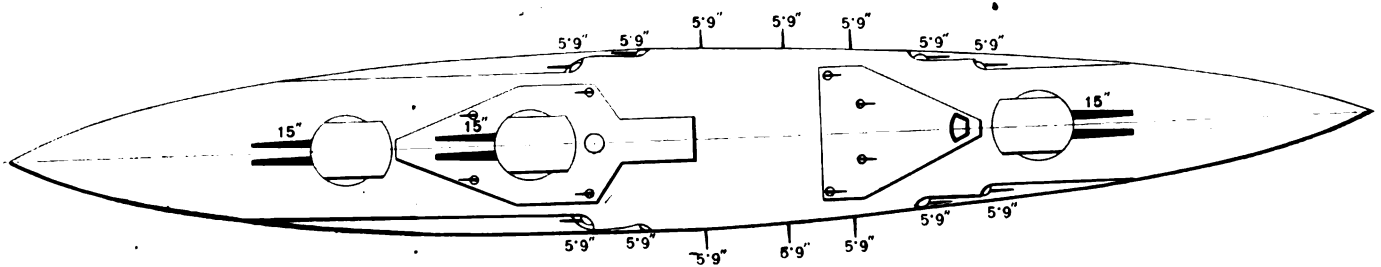
Graf von Spee. **Prinz Eitel Friedrich.**

(Not completed.)





Length, L.W.L., 715½ ft.; 27,000 tons;
Armament, 6—15 in., 14—5·9 in., 8—3·4 in. A.A.

See page 303.

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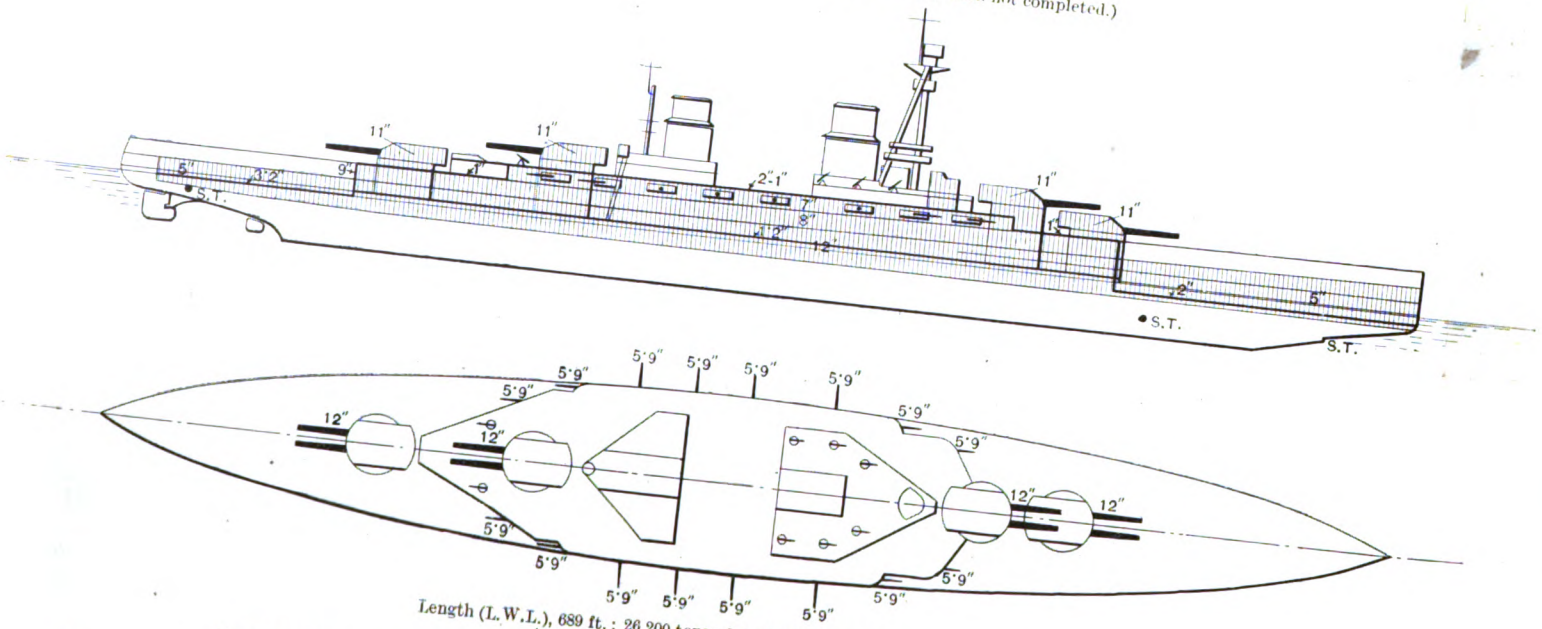
GERMANY.

BATTLE CRUISERS.

Hindenburg. **Mackensen.** **Derfflinger.**

(Hindenburg and Derfflinger interned at Scapa Flow; Mackensen not completed.)



Length (L.W.L.), 689 ft.; 26,200 tons; Speed, 28 knots; Completed, 1917–18;
Armament, 8—12 in., 16—5·9 in., 8—3·4 in. A.A.

NOTE.—In Derfflinger the superstructure is continuous between funnels, and 14—5·9 in. are mounted as secondary armament.

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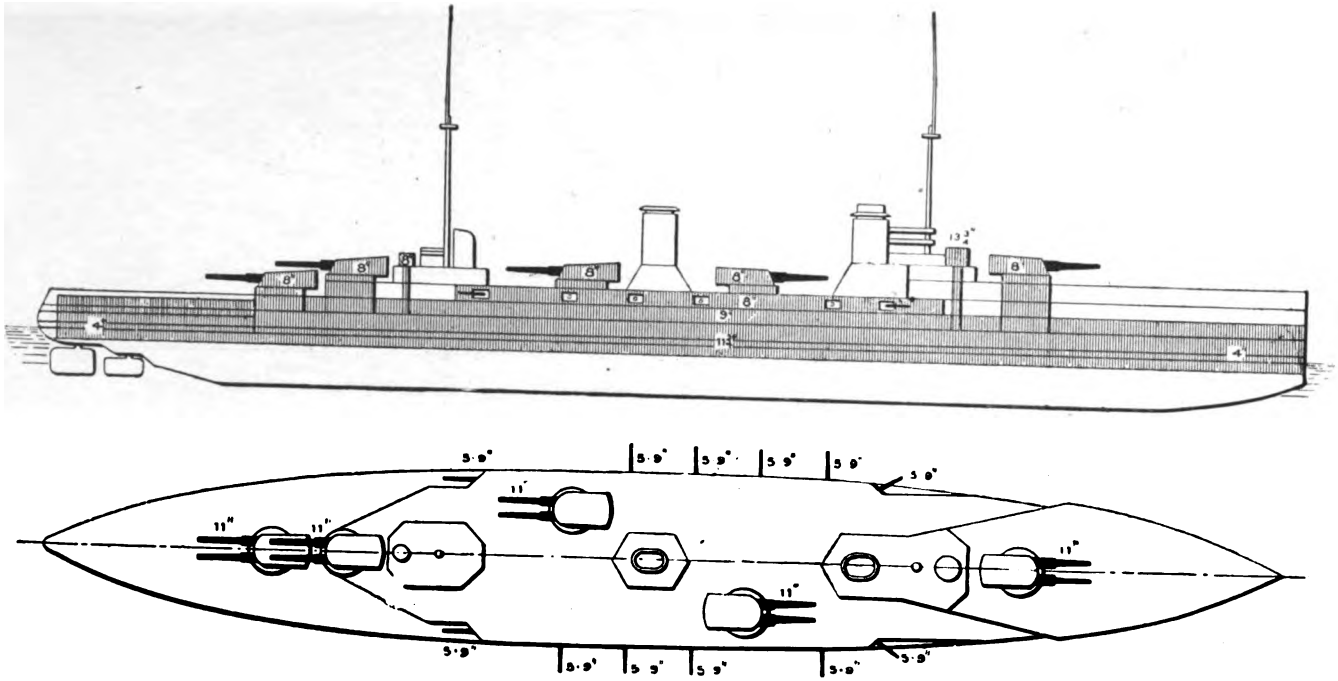
GERMANY.

BATTLE-CRUISER (Interned at Scapa Flow).

Seydlitz.



Length on W.L., 656 ft. ; 24,610 tons ; Speed, 26·75 knots ; Completed, 1913 ;
Armament, 10—11 in., 12—5·9 in., 2—3·4 in.

See page 305.

PLATE 47.
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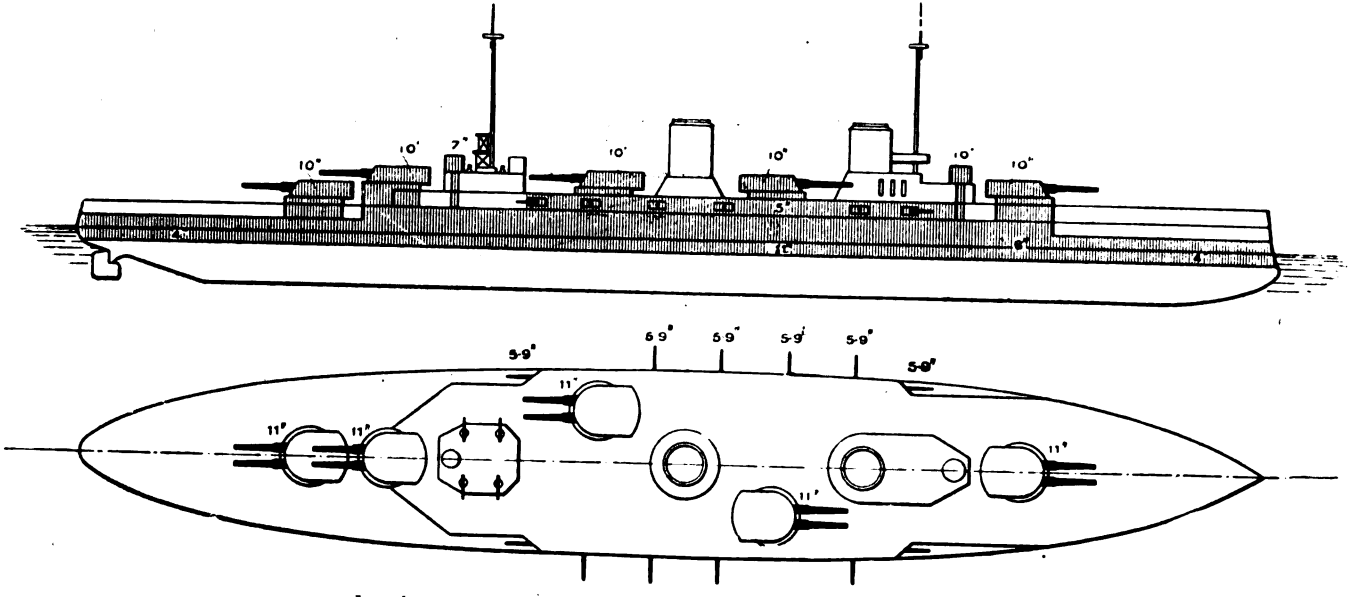
GERMANY.

BATTLE-CRUISER.

Moltke (Interned at Scapa Flow). (**Goeben**, transferred to Turkey and named Sultan Selim).



Length on W.L., 610 ft. ; 22,640 tons ; Speed, 27·25 knots ; Completed, 1911-12 ;
Armament, 10—11 in., 12—5·9 in., 2—3·4 in.

See pages 304, 330.

PLATE 48.

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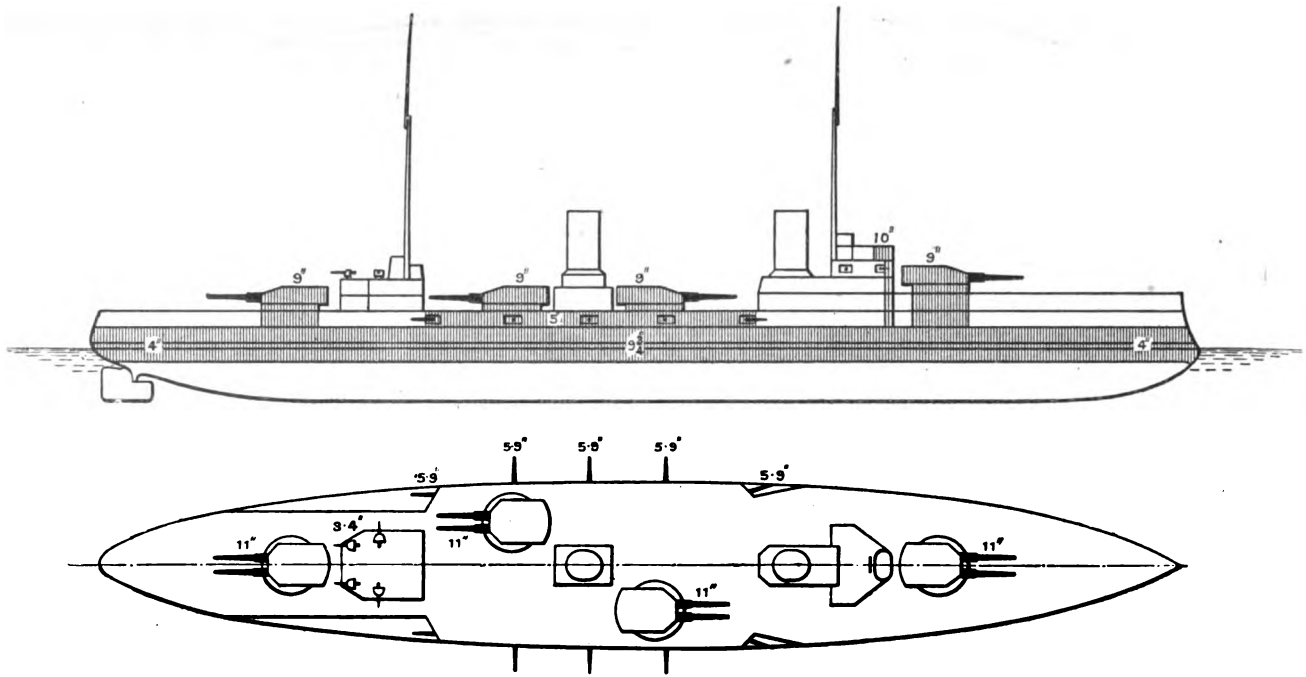
BATTLE-CRUISER (Interned at Scapa Flow).

Von der Tann.



Length on W.L., 563 ft. ; 19,100 tons ; Speed, 26 knots ; Completed, 1918 ;
Armament, 8—11 in., 10—5·9 in., 4—3·4 in. A.A., 2 M.

See page 305.

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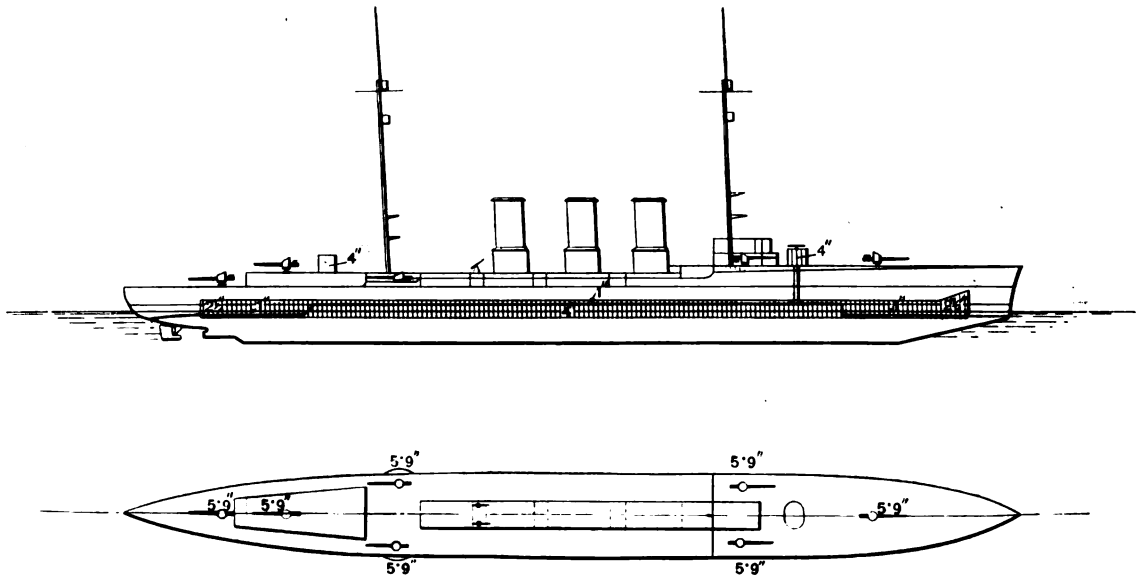
GERMANY.

LIGHT CRUISERS (Interned at Scapa Flow).

Graudenz. **Regensburg.**



Length, 456 ft. ; 4842 tons ; Speed, 27½ knots ; Completed, 1914–15.
Armament, 7—5·9 in., 2—3·4 in. A.A.

See pages 306, 307.

NOTE.—The above are typical of all recent German Light Cruisers, except the mine-laying cruisers Brummer and Bremse, in which no armour belt is fitted and an all-centre-line armament adopted.

PLATE 50.

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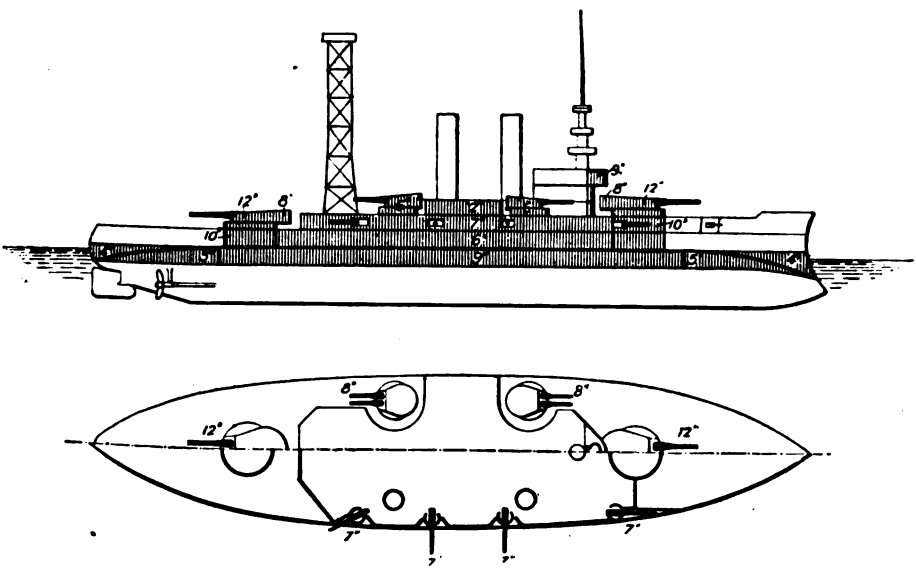
GREECE.

BATTLESHIPS.

Lemnos (*ex*-Idaho). **Kilkis (*ex*-Mississippi).**

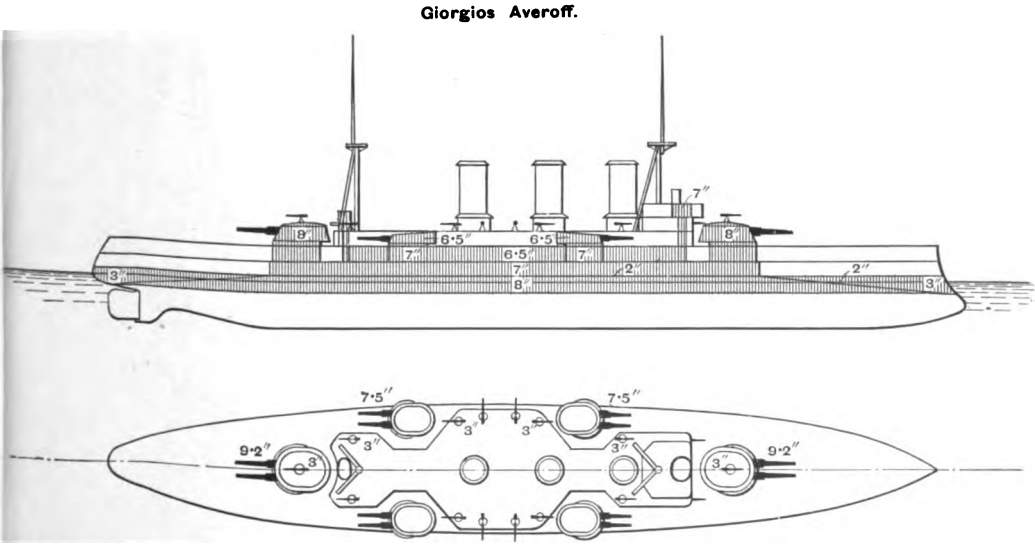


Length, 375 ft. ; 13,000 tons ; Speed, 17 knots ; Completed, 1908 ;
Armament, 4—12 in., 8—8 in., 8—7 in., 12—3 in., 20 small.

See page 303.

ARMOURED CRUISER.

Giorgios Averoff.



Length, 430 ft. ; 9956 tons ; Speed, 24 knots ; Completed, 1911 ;
Armament, 4—9·2 in., 8—7·5 in., 16—3 in., 8 small.

See page 308.

PLATE 51.

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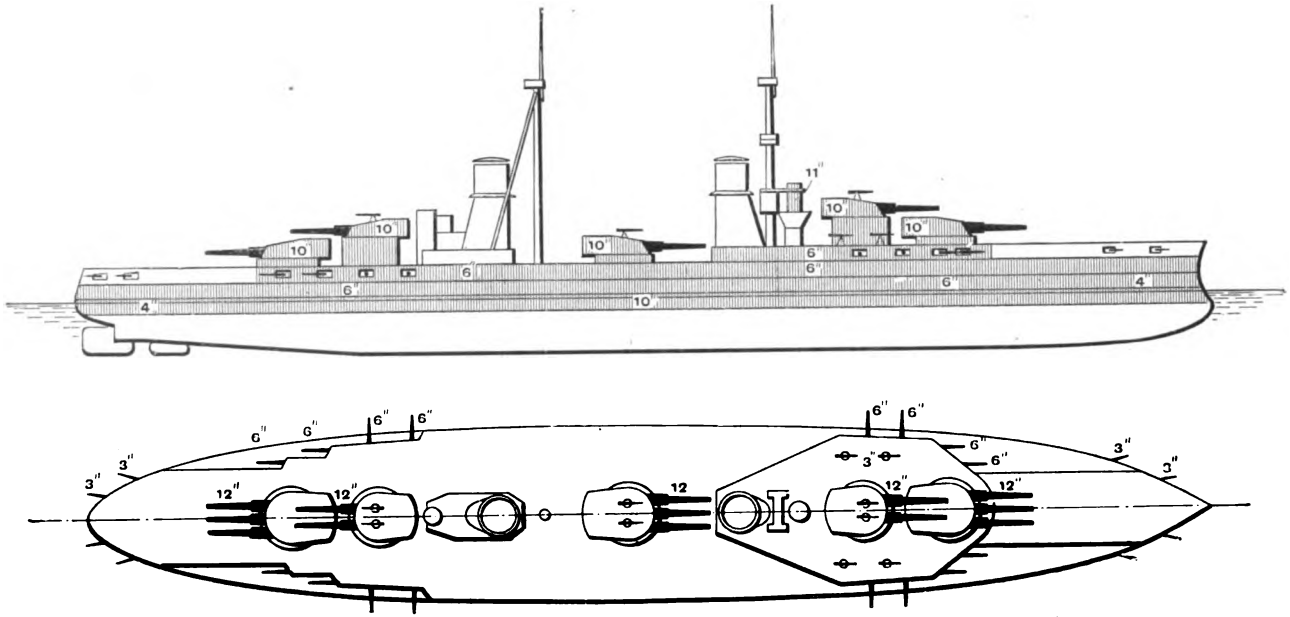
ITALY.

BATTLESHIPS.

Andrea Doria. **Caio Duilio.**



Length, 570 ft. ; 23,025 tons ; Speed, 23 knots ; Completed 1915 ;
Armament, 13—12 in., 16—6 in., 14—12 pr., 6 small.

N.B.—In the next succeeding class, Francesco Morosini, Caracciolo, Cristoforo Colombo, and Marcantonio Colonna, eight 15-in. guns were being mounted in four turrets on the middle line, as in the Queen Elizabeth. Work on these vessels has been stopped.

See page 300.

PLATE 52.

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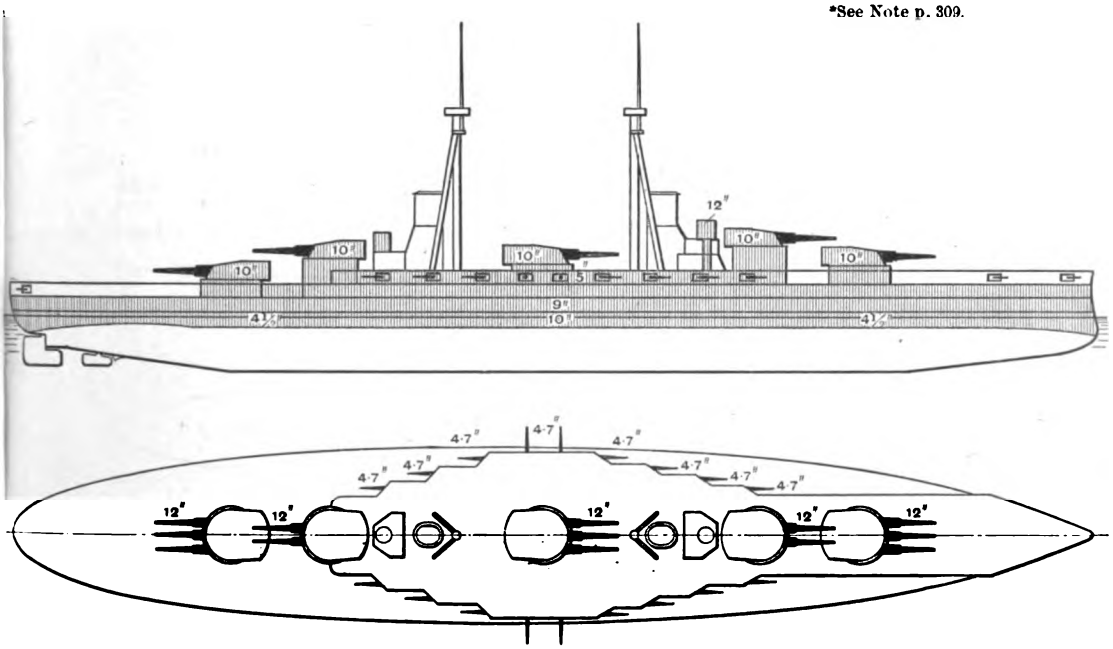
ITALY.

BATTLESHIPS.

Conte di Cavour. **Giulio Cesare.** **Leonardo da Vinci.***

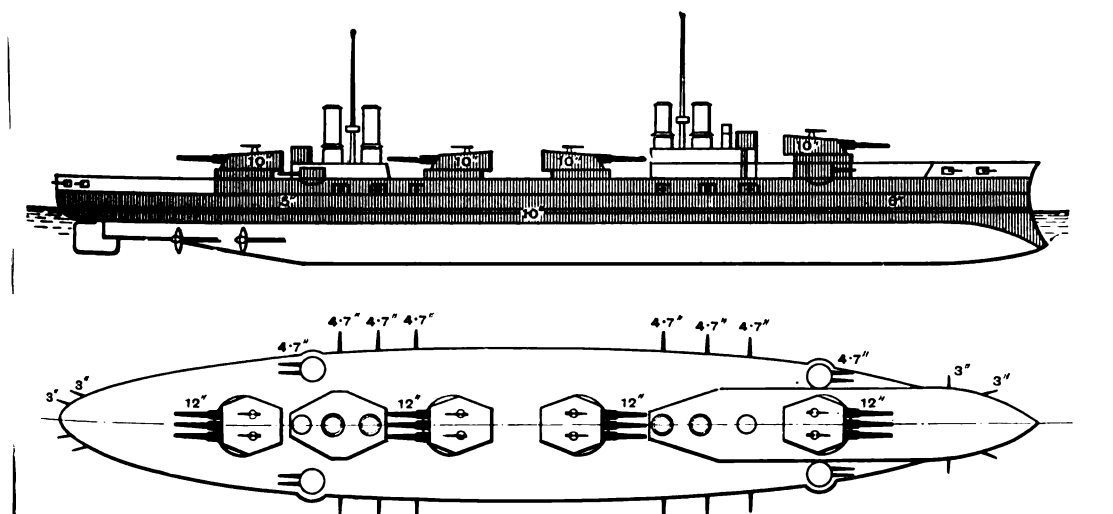
*See Note p. 309.



Length, 557 ft. ; 22,340 tons ; Speed, 22·5–23 knots ; Completed 1914, 1915 ;
Armament, 13—12 in., 18—4·7 in., 14—12 pr.

See page 309.

Dante Alighieri.



Length, 505 ft. ; 19,400 tons ; Speed, 23·8 knots ; Completed, 1912 ;
Armament, 12—12 in., 20—4·7 in., and small.

See page 309.

PLATE 53.

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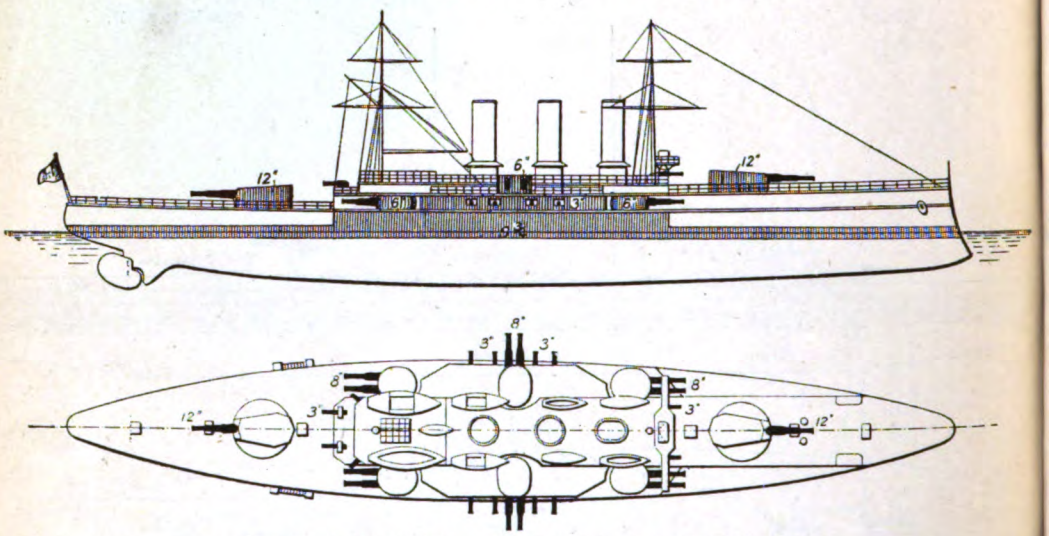
ITALY.

BATTLESHIPS.

Vittorio Emanuele. **Napoli.** **Regina Elena.** **Roma.**

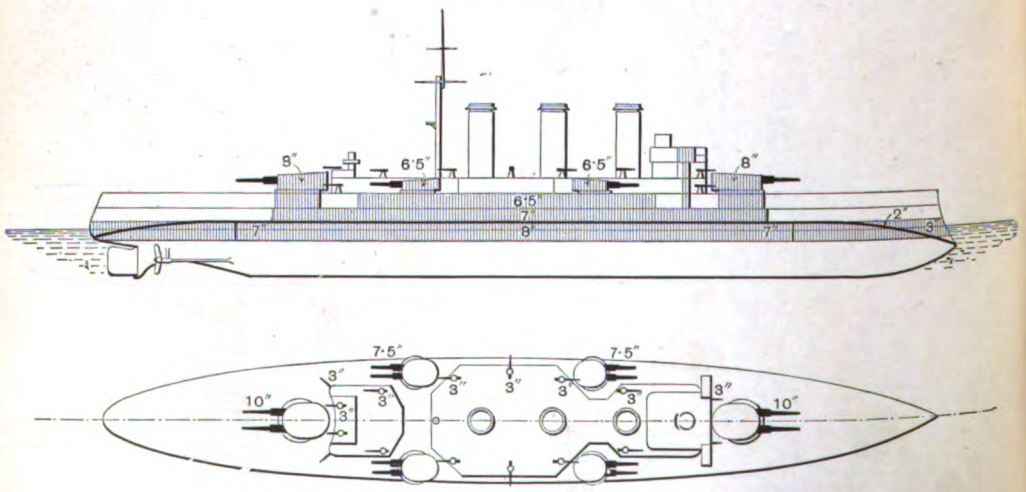


Length, 435 ft. ; 12,425 tons ; Speed, 22 knots ; Completed, 1907—1909 ;
Armament, 2—12 in., 12—8 in., 12—3 in., 12 small.

See page 310.

ARMOURED CRUISER.

Pisa.



Length, 430 ft. ; 9956 tons ; Speed, 23 knots ; Completed, 1909 ;
Armament, 4—10 in., 8—7·5 in., 16—3 in., 2 small.

See page 310.

PLATE 54.

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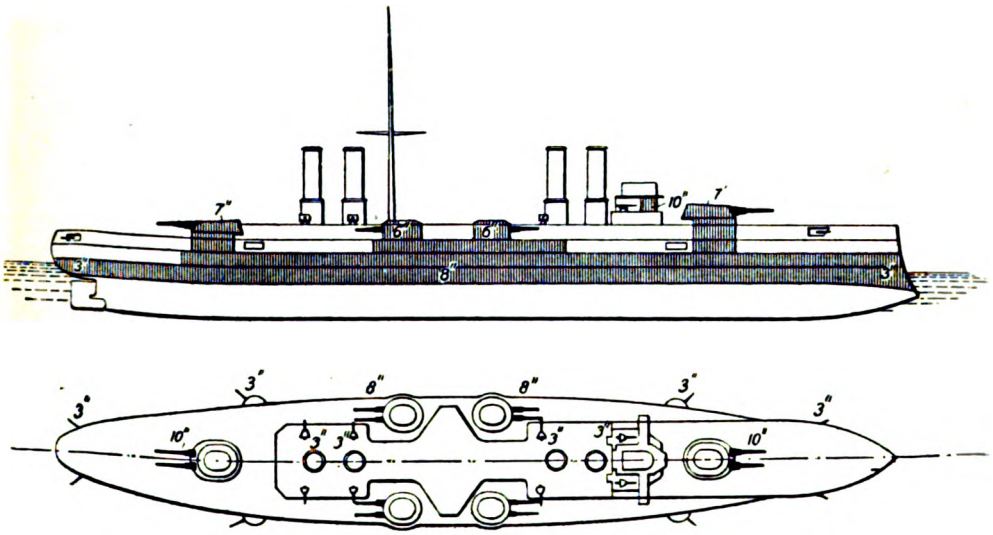
ARMOURED CRUISERS.

S. Giorgio. **S. Marco.**



Length, 430 ft. ; 9832 tons ; Speed, 22·5 knots ; Completed, 1910 ;
Armament, 4—10 in., 8—8 in., 16—3 in., 8 small.

See page 310.

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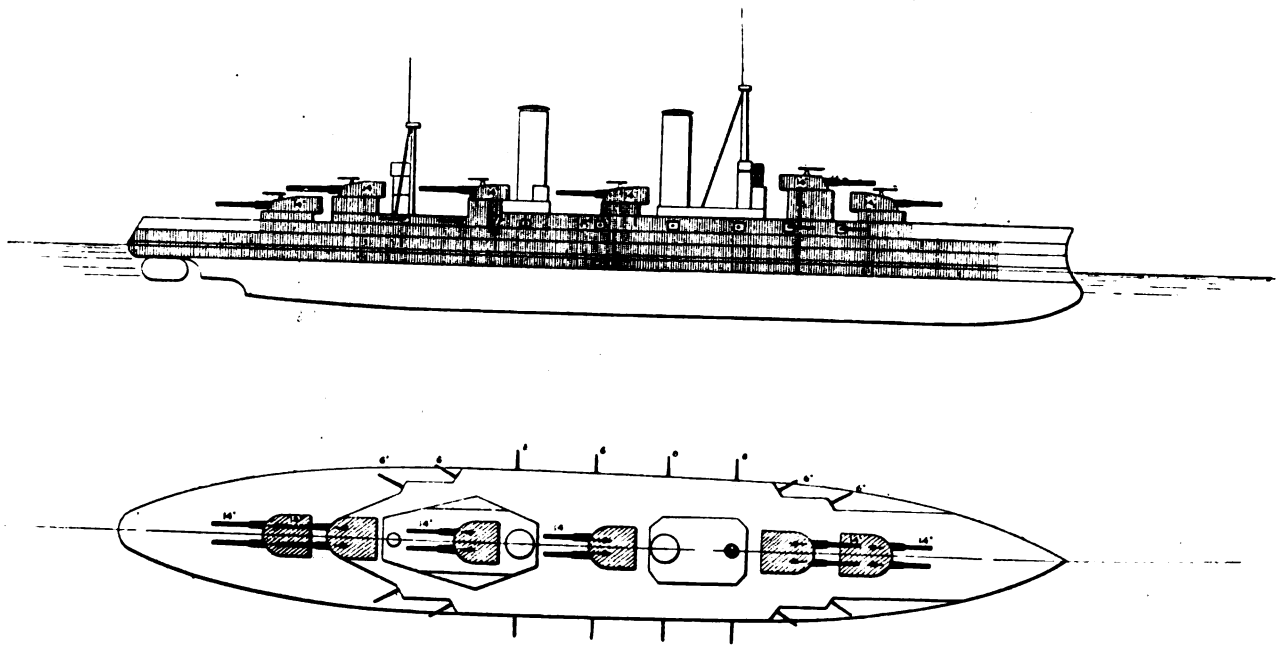
JAPAN.

BATTLESHIPS.

Fuso. **Hyuga.** **Ise.** **Yamashiro.**



Length, 658 ft. ; 31,000 tons ; Speed, 22·5 knots ; Completed 1915—1918 ;
Armament, 12—14-in., 16—6-in., 4—12 pr.

NOTE.—The armour on the turrets is 12 in., not 14 in. as shown, and, owing to an oversight in the drawing, the armoured substructure of the conning-tower is not shown ; also the water-line belt is continued to the bows.

See pages 313, 314, 315.

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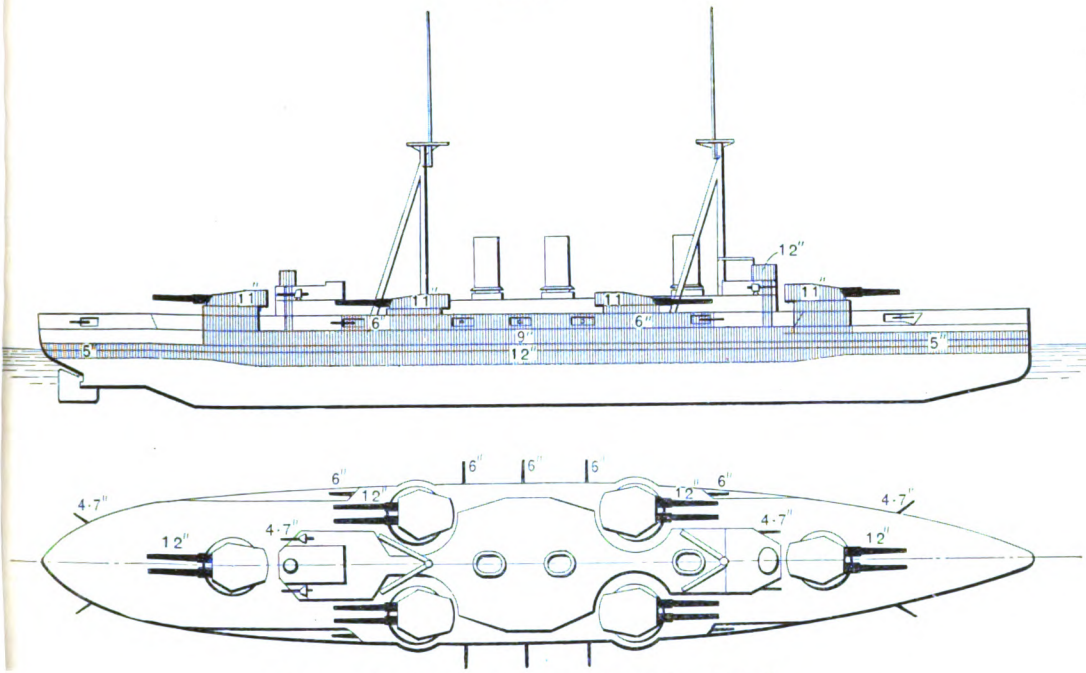
JAPAN.

BATTLESHIPS.

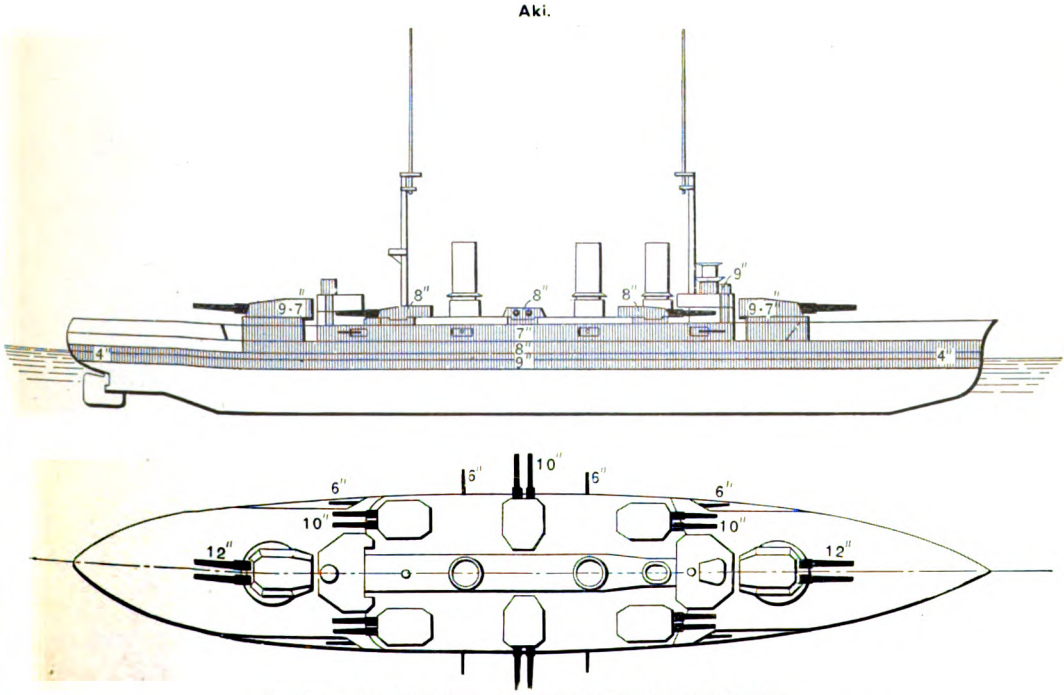
Settsu.



Length, 500 ft. ; 20,800 tons ; Speed, 20·5 knots ; Completed, 1912 ;
Armament, 12—12 in., 10—6 in., 8—4·7 in., 16 small.

See page 315.

Aki.



Length, 400 ft. ; 19,800 tons ; Speed, 20·5 knots ; Completed, 1911 ;
Armament, 4—12 in., 12—10 in., 8—6 in., 8—12 pr., 8 small.

See page 313.

PLATE 57.

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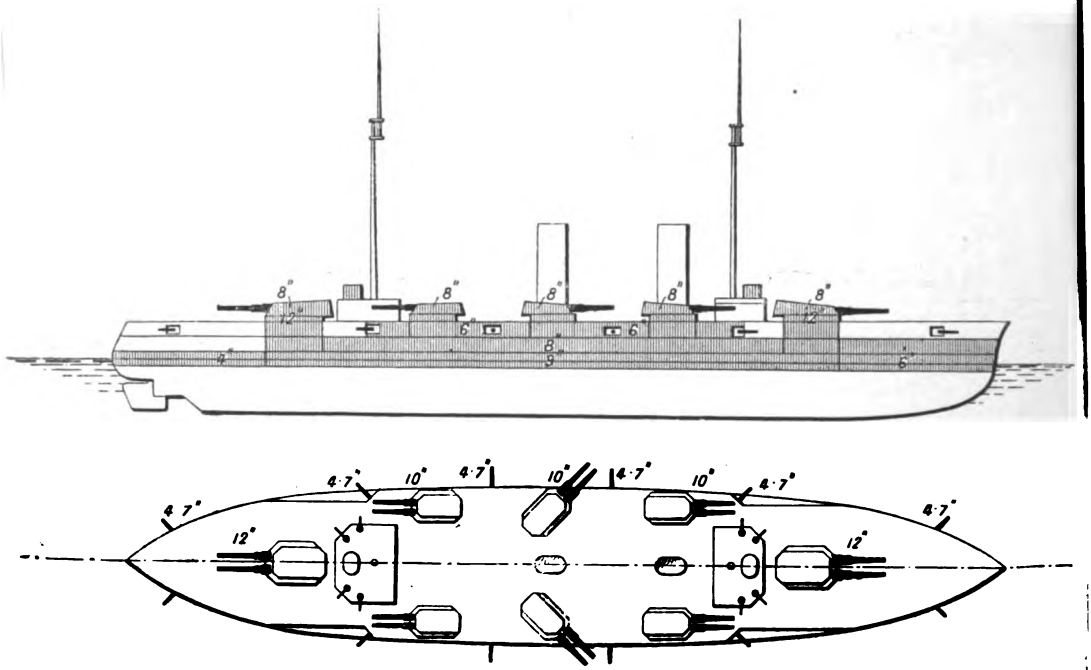
JAPAN.

BATTLESHIPS.

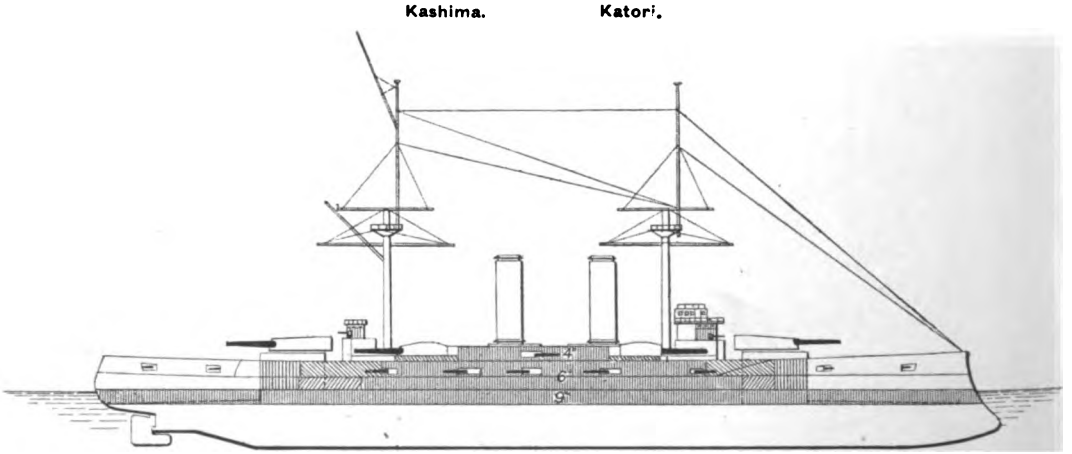
Satsuma.

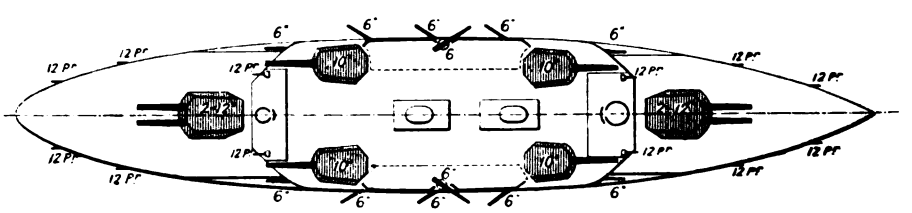


Length, 450 ft. ; 19,350 tons ; Speed, 18·5 knots ; Completed, 1910 ;
Armament, 4—12 in., 12—10 in., 12—4·7 in., 4—12 pr., 8 small.

See page 315.

Kashima. Katori.





Length, 420–425 ft. ; 15,950–16,400 tons ; Speed, 19·5 knots ; Completed, 1906 ;
Armament, 4—12 in., 4—10 in., 12—6 in., 12—12 pr., 11 small.

See page 314.

PLATE 58.

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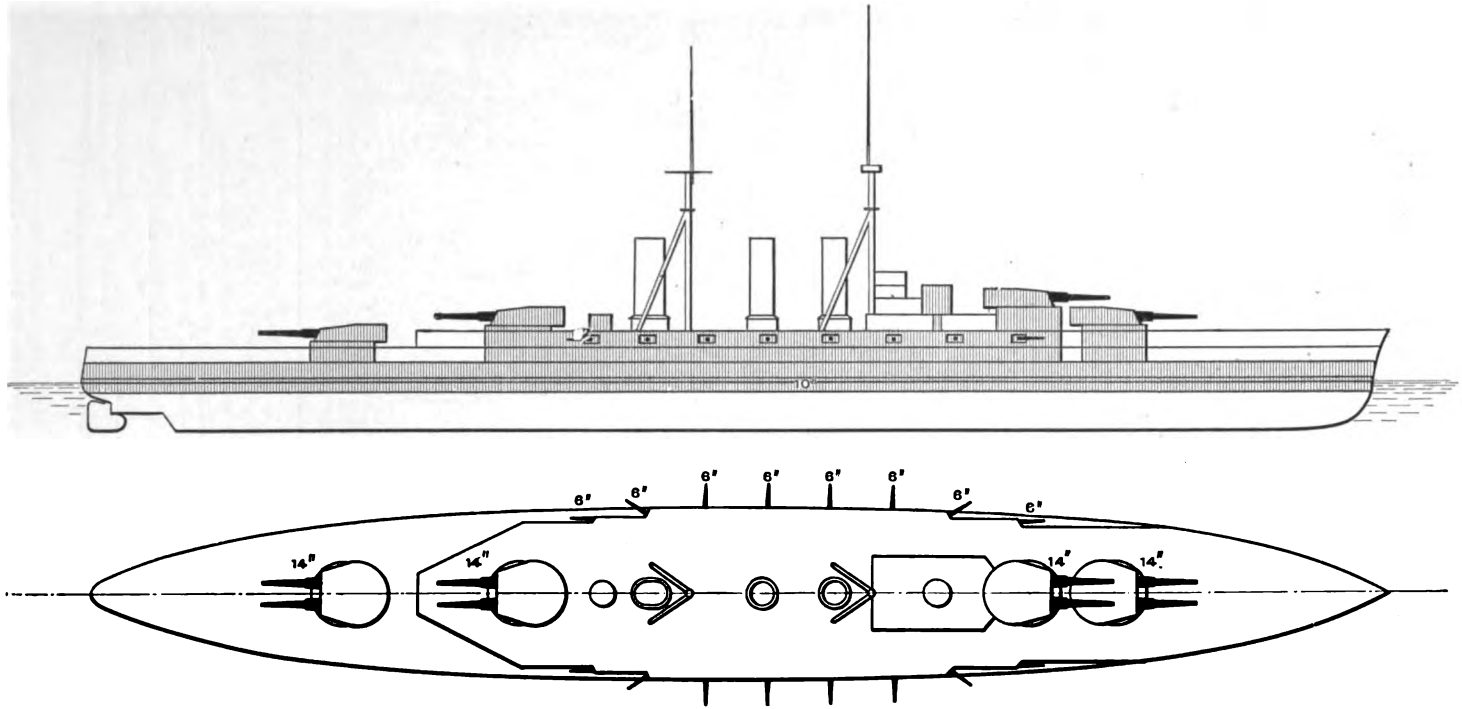
JAPAN.

BATTLE-CRUISERS.

Kongo. **Hiyei.** **Haruna.** **Kirishima.**



Length, 704 ft. ; 27,500 tons ; Speed, 27 knots ; Completed, 1913--1916
Armament, 8—14 in., 16—6 in., 18 small.

See pages 313, 314.

PLATE 59.

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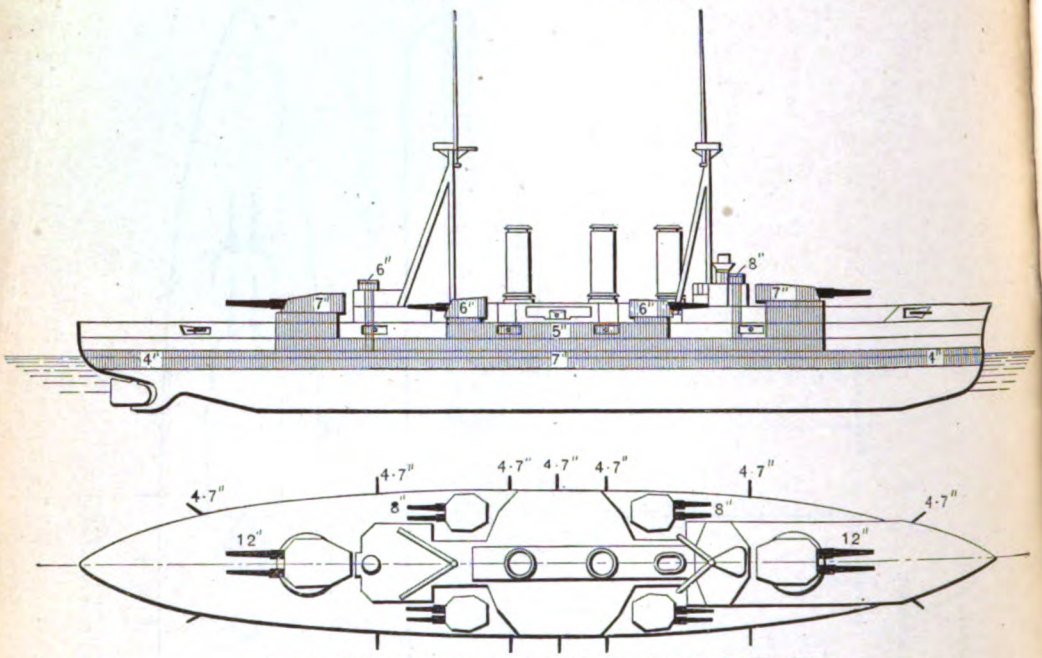
JAPAN.

ARMOURED CRUISERS.

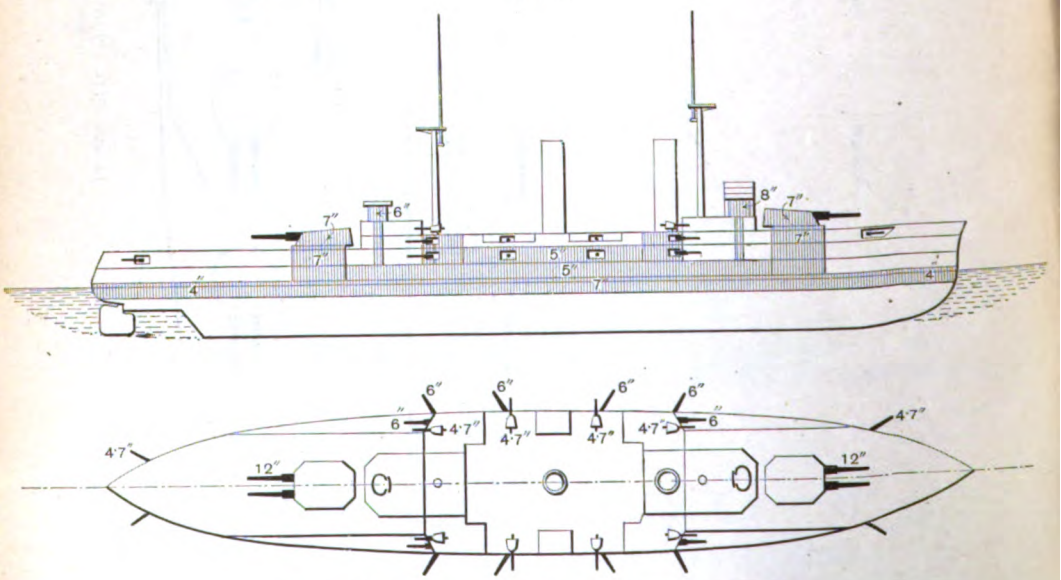
Ibuki. **Kurama.**



Length, 450 ft. ; 14,620 tons ; Speed, 22 knots ; Completed, 1909—1911 ;
Armament, 4—12 in., 8—8 in., 14—4·7 in., 9 small.

See pages 313, 314.

Ikoma.



Length, 440 ft. ; 13,750 tons ; Speed, 21 knots ; Completed, 1907 ;
Armament, 4—12 in., 12—6 in., 12—4·7 in., 8 small.

See page 314.

PLATE 60.

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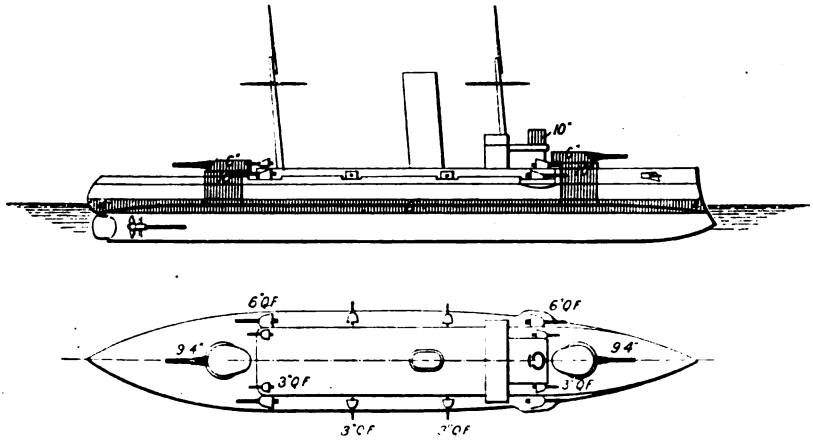
NETHERLANDS.

COAST DEFENCE SHIPS.

De Ruyter. **Hertog Hendrik.** **Koningin Regentes** **Marten Tromp.**



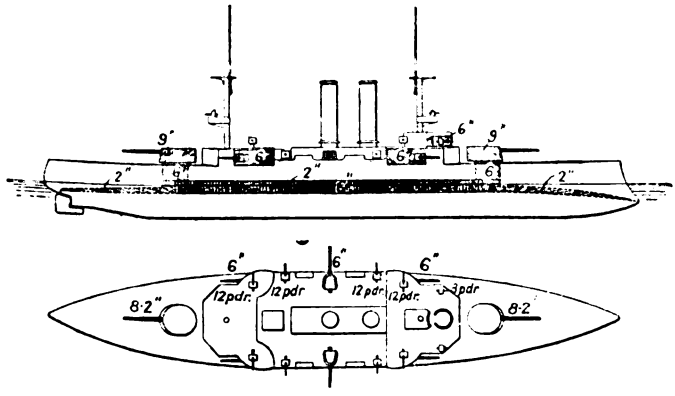
Length, 317 ft.; 5014—5211 tons; Speed, 16·5 knots; Completed, 1902—1906;
Armament, 2—9·4 in., 4—6 in., 8—3 in., 4 small.

See page 318.

NORWAY.

COAST DEFENCE SHIPS.

Norge. **Eidsvold.**



Length, 290 ft.; 3847 tons; Speed, 16·5 knots; Completed, 1901;
Armament, 2—8·2 in., 6—6 in., 8—12 pr., 6 small.

See page 320.

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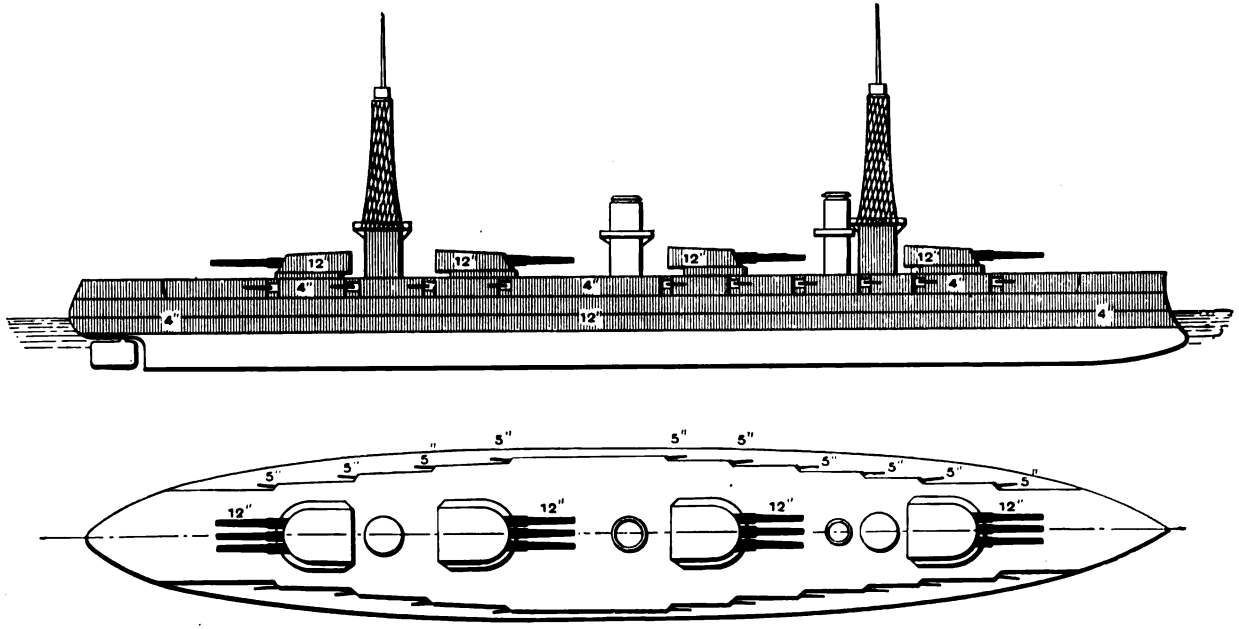
RUSSIA.

BATTLESHIP.

Volya (*ex* Imperator Alexander III).



Length, 551 ft.; 22,500 tons; Speed, 21 knots; Completed, 1915;
Armament, 12—12 in., 20—5 in.

The sister ships of the Volya, Imperatritsa Maria (blown up at Sevastopol, Oct. 20, 1916) and Ekaterina II, renamed Svobodnaya Rossiya, were lost in the war.

See page 323.

PLATE 62.

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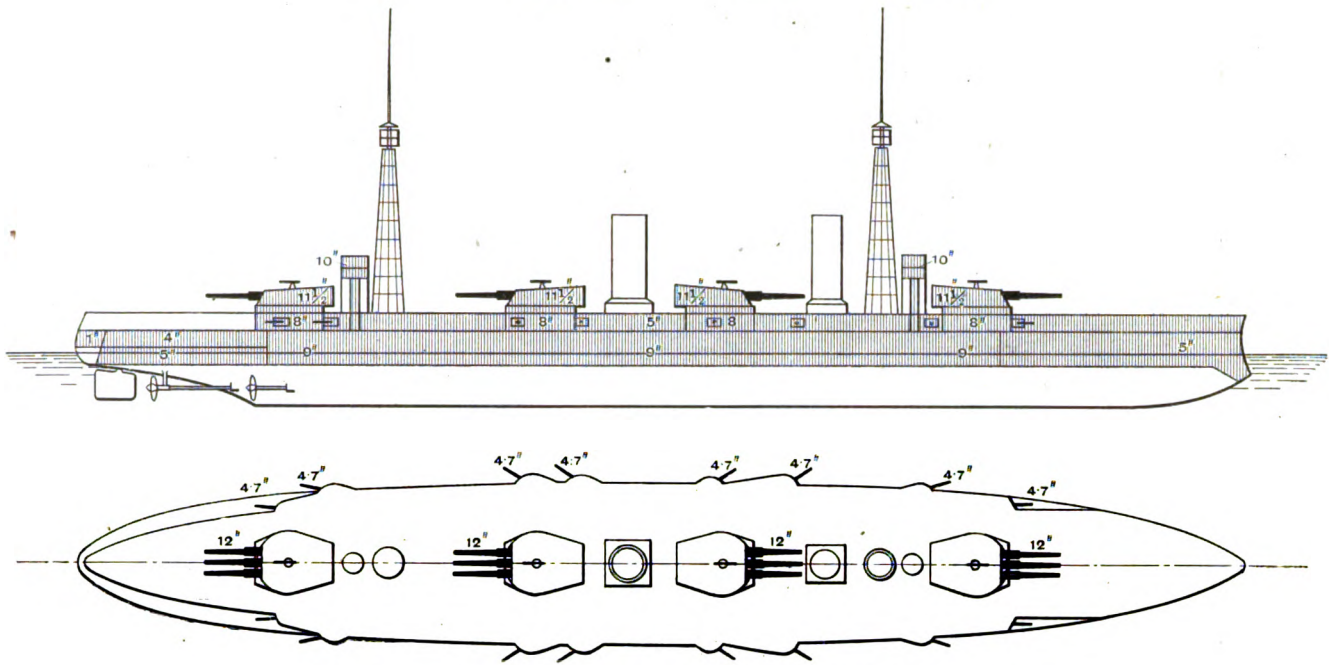
RUSSIA.

BATTLESHIPS.

Gangut. **Petropavlovsk.** **Poltava.** **Sevastopol.**



Length, 590 ft. ; 23,000 tons ; Speed, 23 knots ; Completed 1915 ;
Armament, 12—12 in., 16—4·7 in., 4—3 pr., 8 small.

See pages 322, **323**.

PLATE 63.

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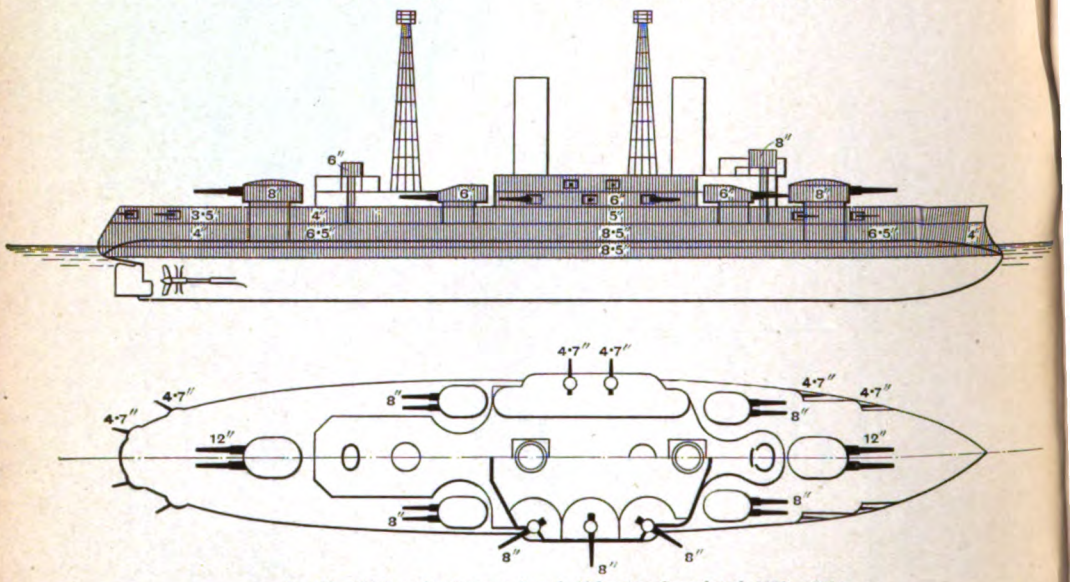
RUSSIA.

BATTLESHIPS.

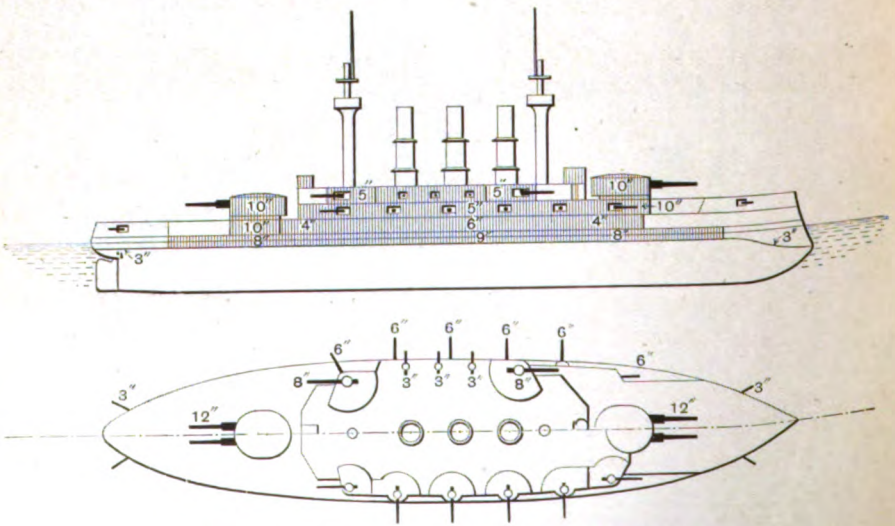
Andrei Pervozvannyi. **Republika (*ex* Imperator Pavel).**



Length, 430 ft. ; 17,400 tons ; Speed, 18 knots ; Completed, 1910—1911 ;
Armament, 4—12 in., 14—8 in., 12—4·7 in., 14 small.

See pages 322, 323.

Evstafi. **Ioann Zlatoust.**



Length, 372 ft. ; 12,733 tons ; Speed, 16 knots ; Completed, 1910-11 ;
Armament, 4—12 in., 4—8 in., 12—6 in., 14—3 in., 18 small.

See page 322.

PLATE 64.

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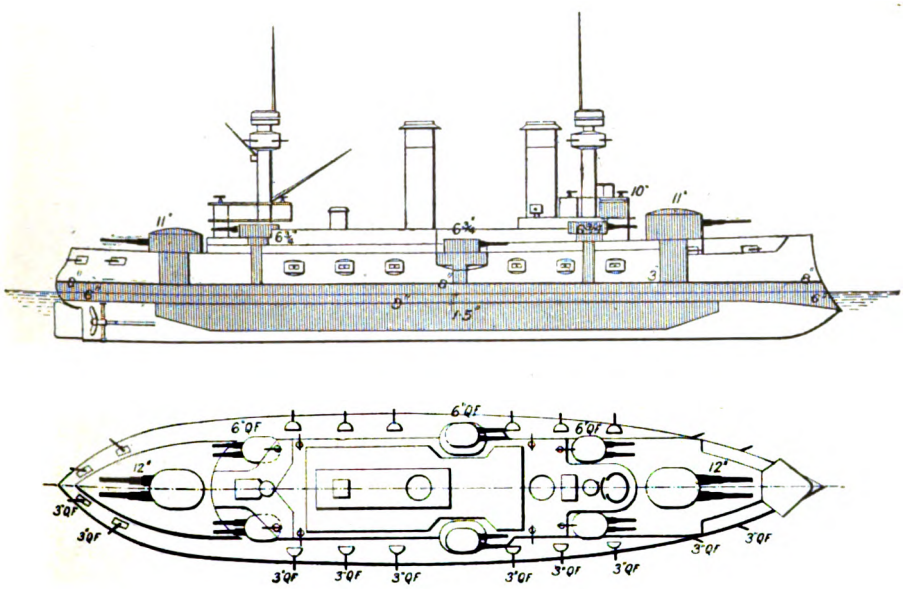
RUSSIA.

BATTLESHIPS.

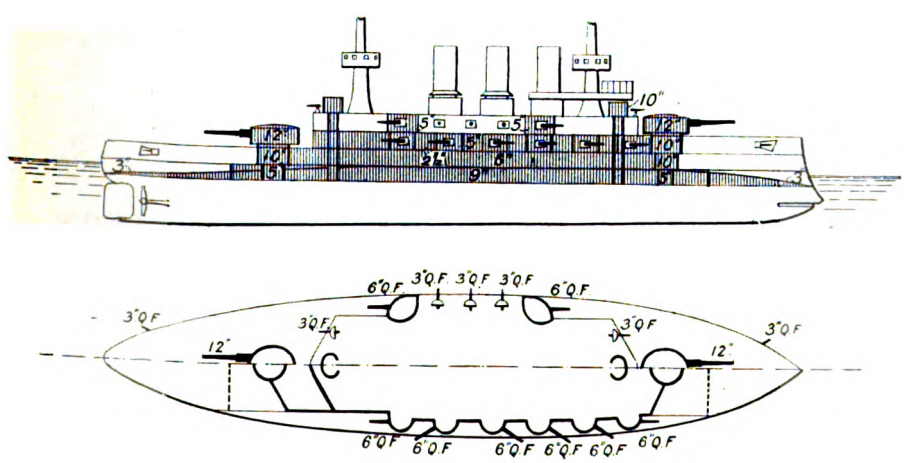
Grazhdanin (*ex* **Cesarevitch**).



Length, 389 ft. ; 12,912 tons ; Speed, 19·6 knots ; Completed, 1903 ;
Armament, 4—12 in., 12—6 in., 20—3 in., 12 small.

See page 322.

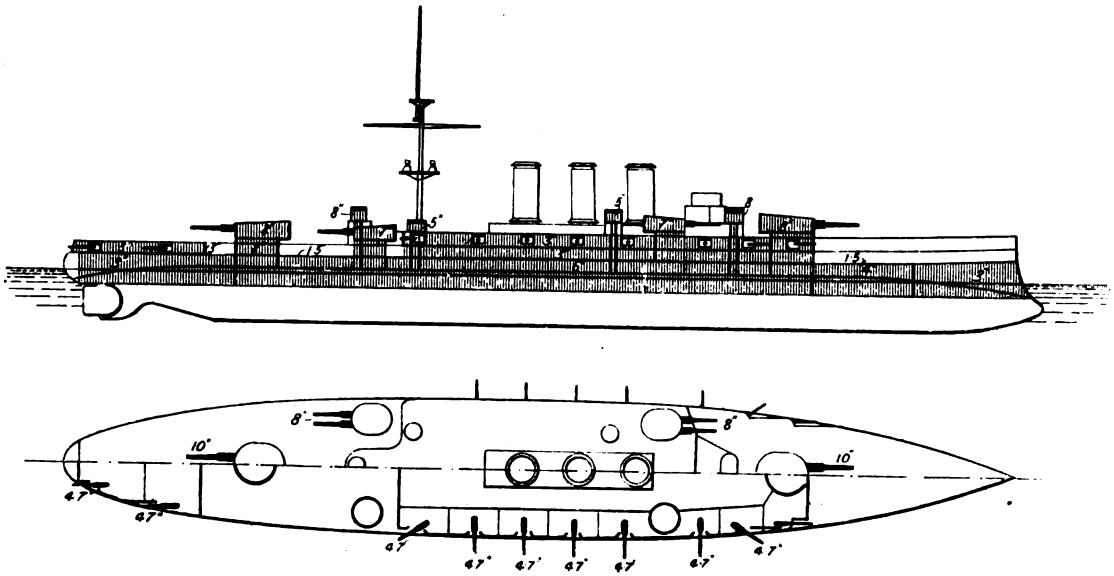
Zoretz za Svobodu (*ex* **Panteleimon**).


10"
12"
10"
6"
6"
6"
6

RUSSIA.

ARMOURED CRUISER.

Rurik.



Length, 490 ft. ; 15,170 tons ; Speed, 21 knots ; Completed, 1907 ;
Armament, 4—10 in., 8—8 in., 20—4·7 in., 14 small.

See page 323.

PLATE 66.

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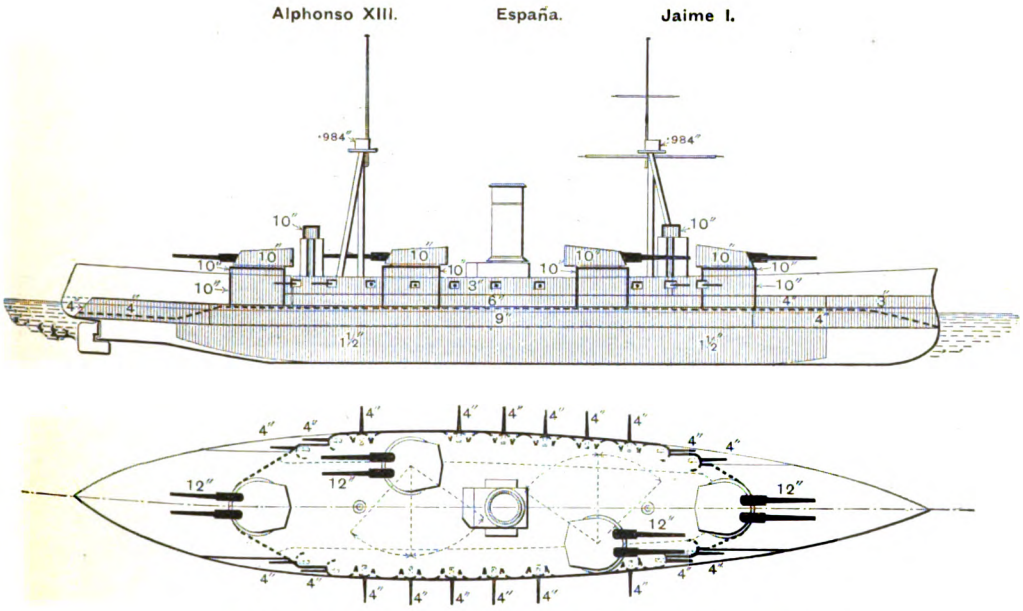
SPAIN.

BATTLESHIPS.

Alphonso XIII. **España.** **Jaime I.**

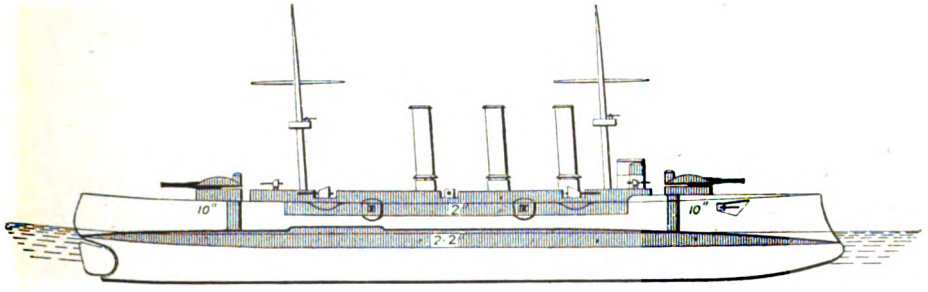


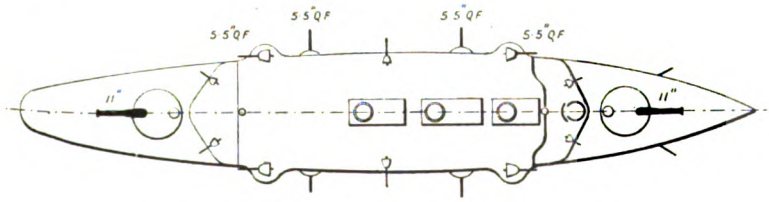
Length, 435 ft. ; 15,460 tons ; Speed, 19·5 knots ; Completed, 1913–1915
Armament, 8—12 in., 20—4 in., 6 small.

See page 326.

ARMOURED CRUISER.

Emperador Carlos V.





Length, 380 ft. ; 9089 tons ; Speed, 20 knots ; Completed, 1898 ;
Armament, 2—11 in., 8—5·5 in., 4—3·9 in., 12 small.

See page 326.

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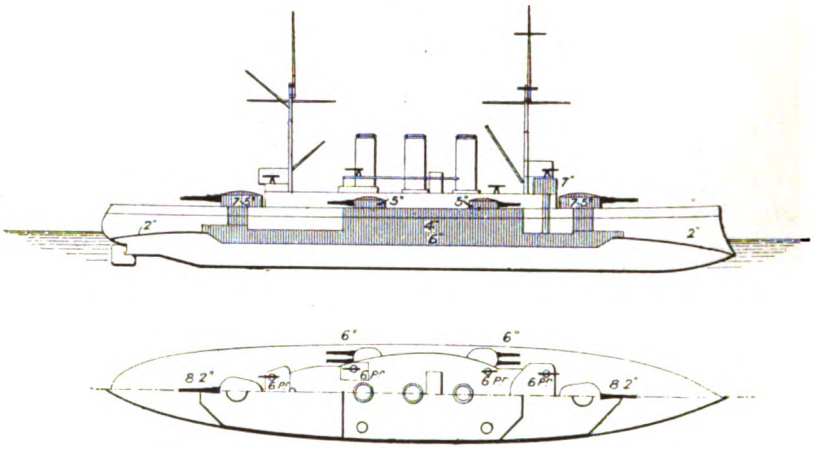
SWEDEN.

BATTLESHIP.

Oscar II.

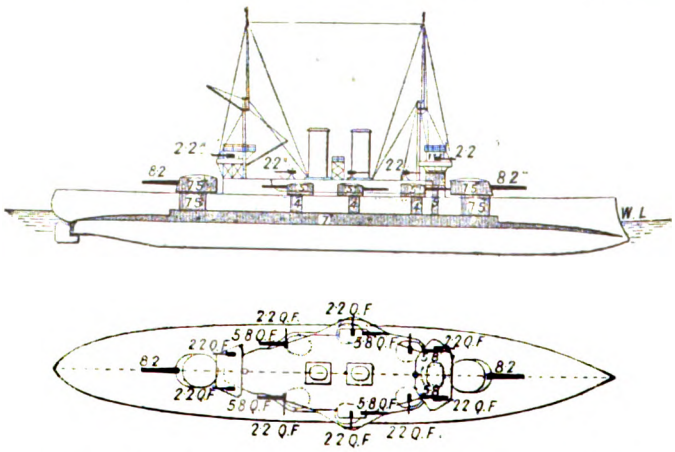


Length, 314 ft. ; 4203 tons ; Speed, 18 knots ; Completed, 1907 ;
Armament, 2—8·2 in., 8—6 in., 14 small.

See page 328.

COAST DEFENCE SHIPS.

Aeran. **Manligheten.** **Tapperheten.** **Wasa.**



Length, 287 ft. ; 3612 tons ; Speed, 16·5–17·2 knots ; Completed, 1902–1906 ;
Armament, 2—8·2 in., 6—5·8 in., 14 small.

See page 328.

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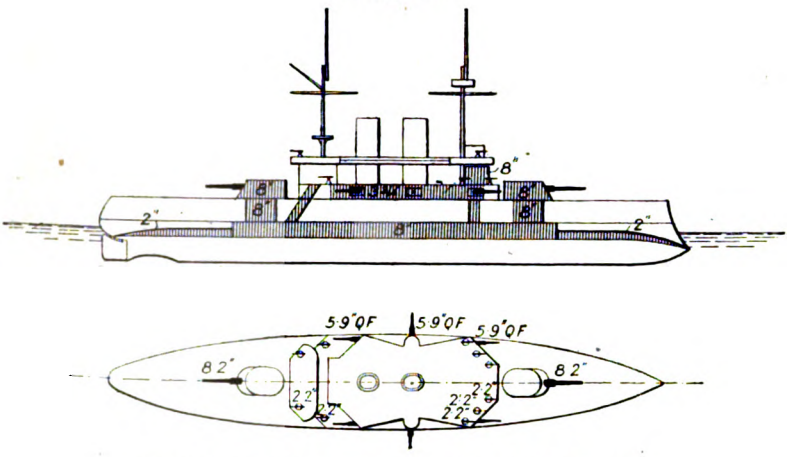
SWEDEN.

COAST DEFENCE SHIP.

Dristigheten.

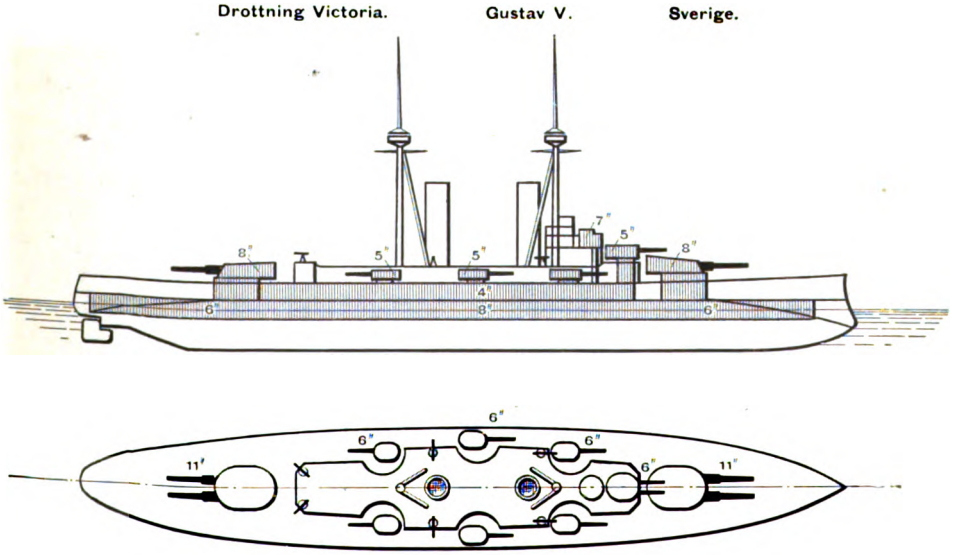


Length, 285 ft. ; 3445 tons ; Speed, 16·5 knots ; Completed, 1901 ;
Armament, 2—8·2 in., 6—5·9 in., 12 small.

See page 328.

ARMOURED CRUISER.

Drottning Victoria. **Gustav V.** **Sverige.**



Length, 390 ft. ; 7,100 tons ; Speed, 22 knots ;
Armament, 4·11 in., 8—6 in. ; 6 –12 pr.

See page 328.

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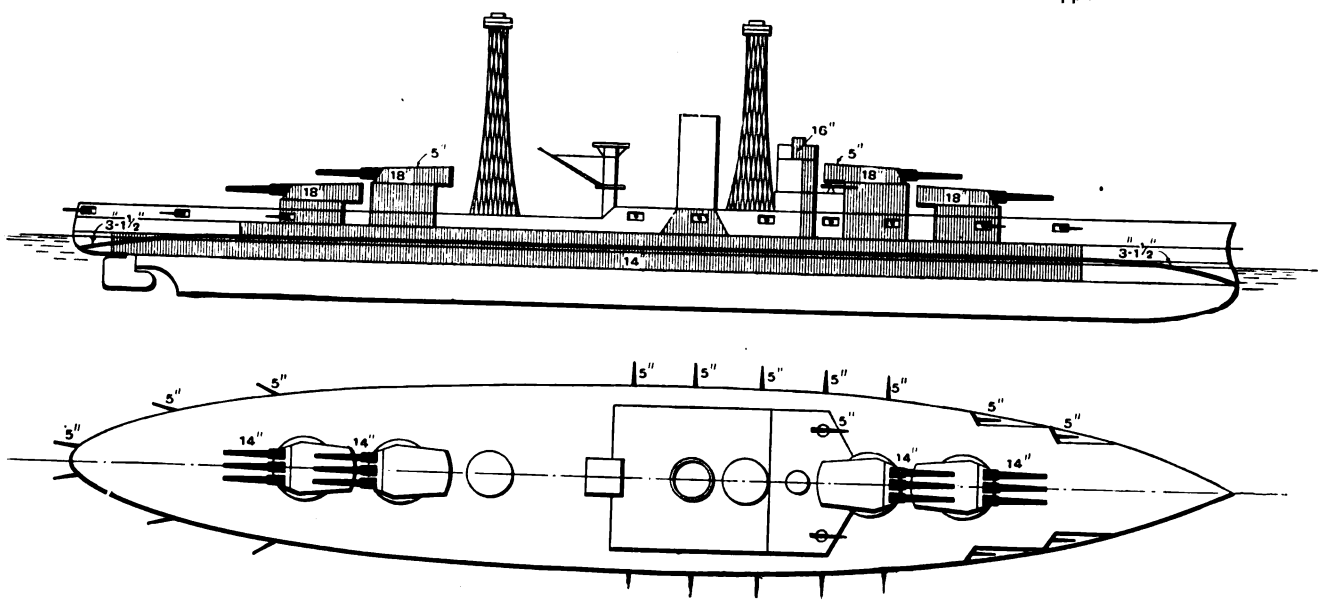
UNITED STATES.

BATTLESHIPS.

Pennsylvania. Arizona. New Mexico.* Idaho.* Mississippi.*



Length, 600 ft.; 31,400 tons; Speed, 21 knots; Completed 1916—1919; Armament, 12—14 in., 14—5 in., are now mounted with 4—3 in. A.A.

See pages 331, 332, 333.

* The New Mexico (originally named California), Idaho, and Mississippi are of 32,000 tons, and the 5-in. guns are grouped in a central position on a higher level than in the Pennsylvania and Arizona.

PLATE 70.

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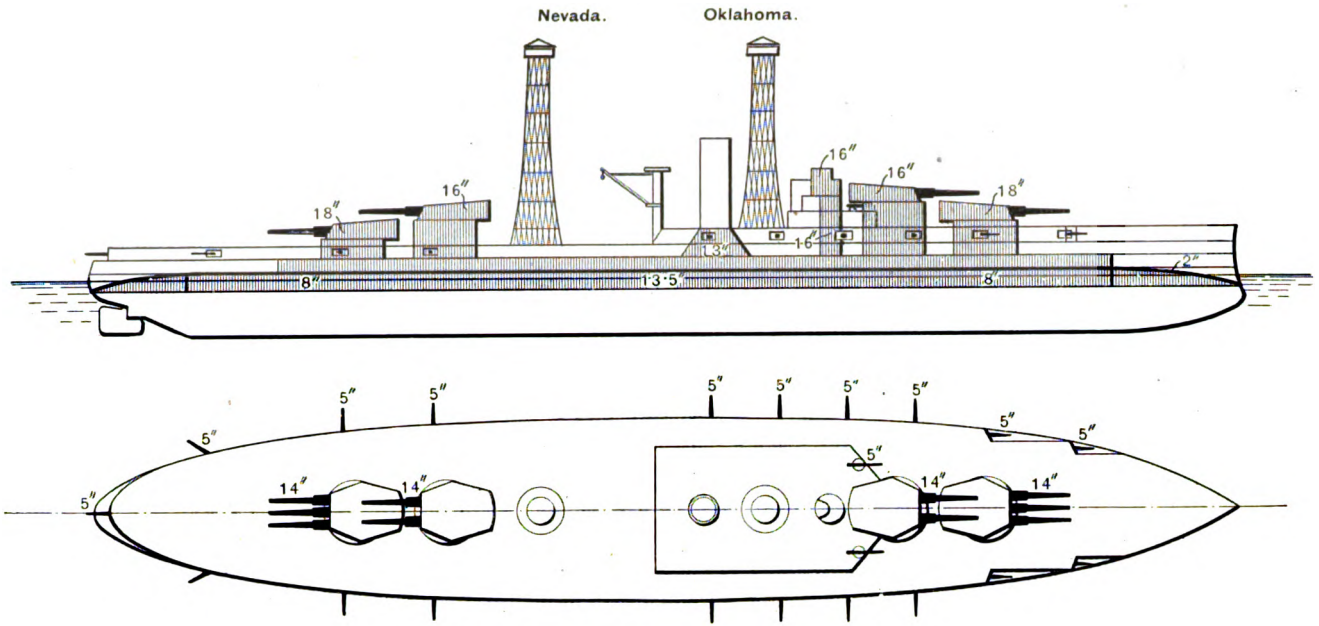
Bbattleships.



Length, 575 ft.; 27,500 tons; Speed, 20·5 knots; Completed, 1915;
Armament, 10—14 in.; there are now 12—5 in., and 2—3 in. A.A.

See page 333.

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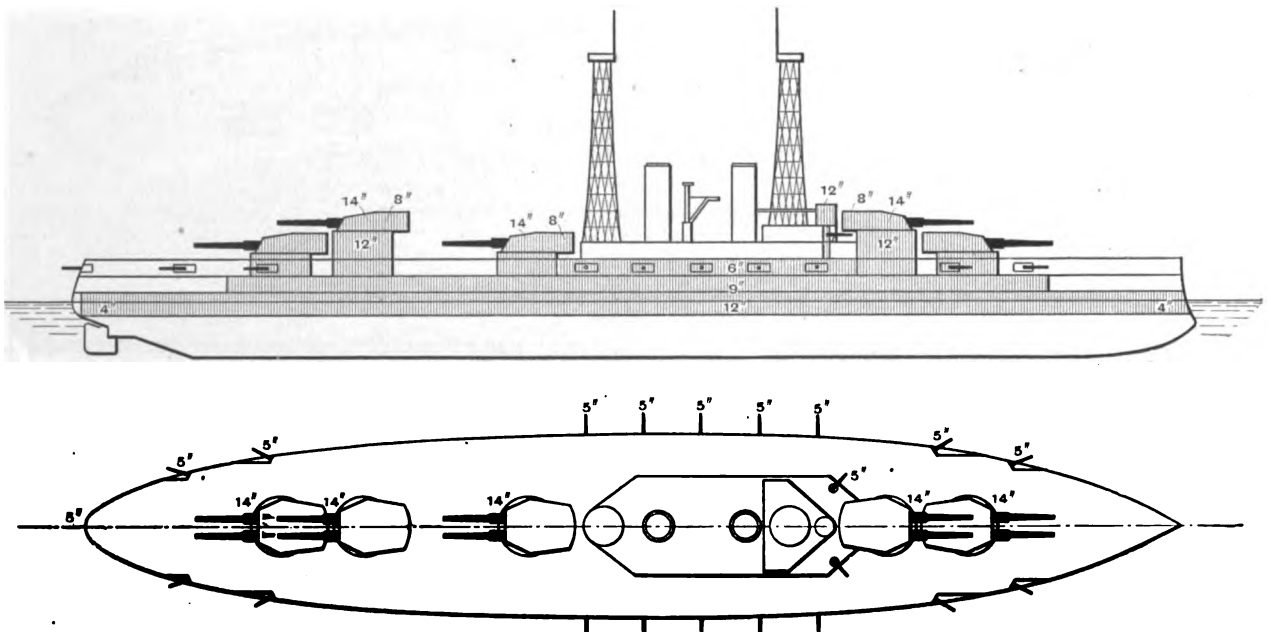
UNITED STATES.

BATTLESHIPS.

New York. **Texas.**



Length, 573 ft. ; 27,000 tons ; Speed, 21 knots ; Completed 1914 ;
Armament, 10—14 in. The secondary armament has been changed ; there are 16—5 in. and 2—3 in. A.A.

See pages 333, 334.

PLATE 72.

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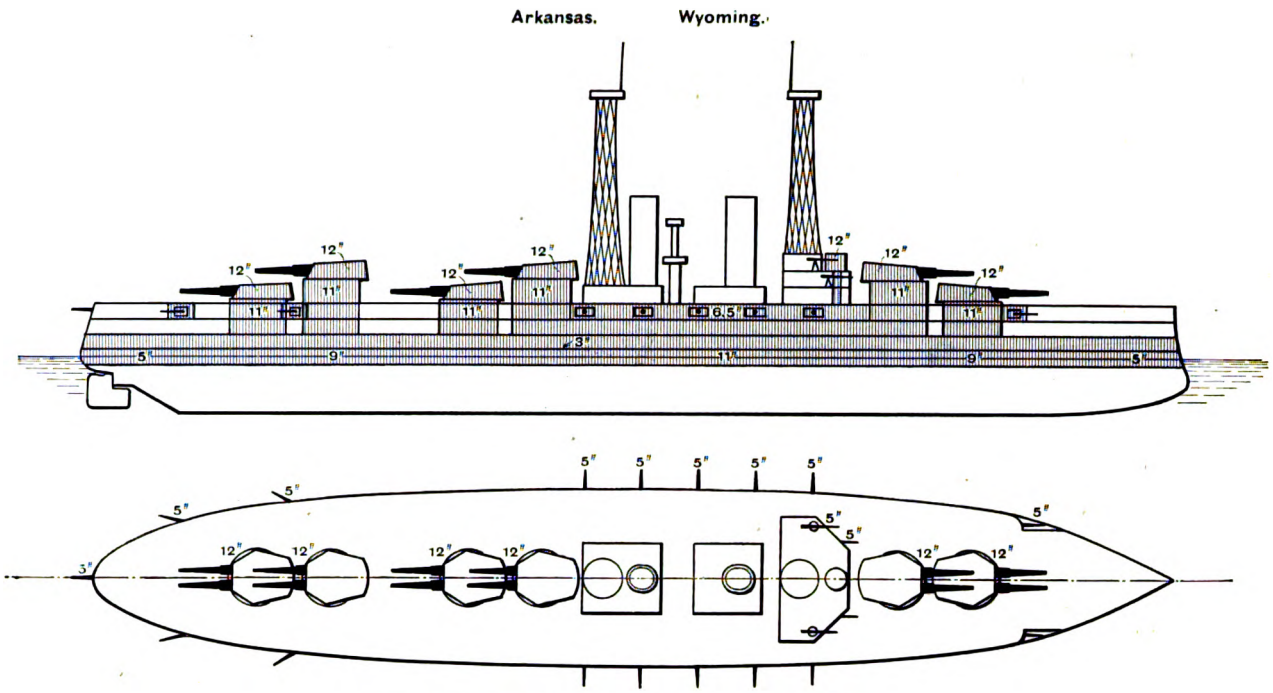
BATTLESHIPS.

Arkansas. **Wyoming.**



Length, 554 ft. ; 26,000 tons ; Speed, 21 knots ; Completed, 1912 ;
Armament, 12—12 in., new secondary armament, 16—5 in., 2—3 in. A.A.

See pages 331, 335.

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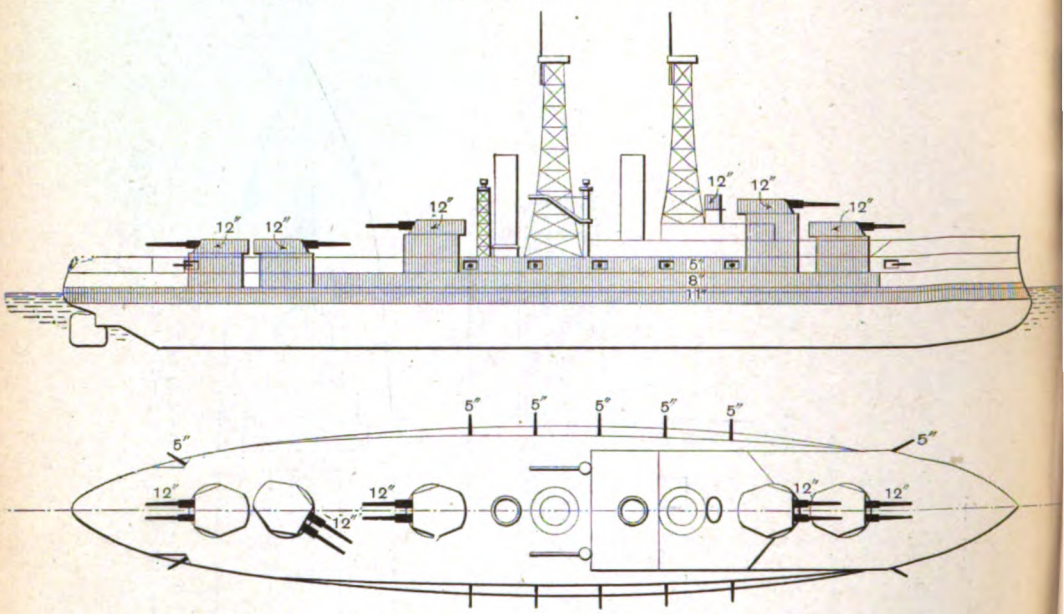
UNITED STATES.

Bbattleships.

Delaware. **North Dakota.** **Florida.** **Utah.**

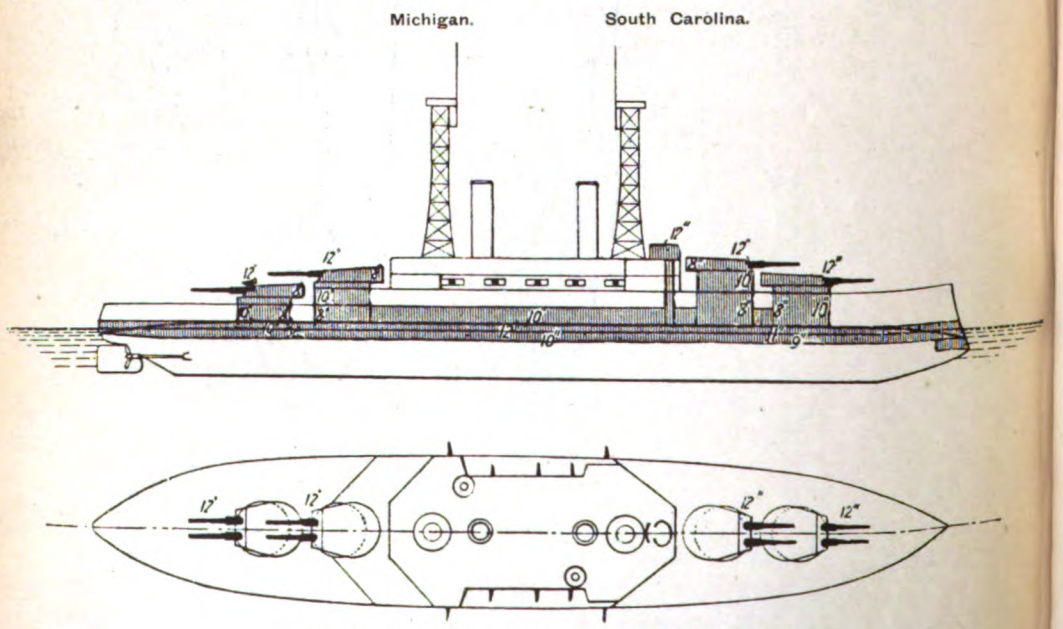


Delaware } Length, 510 ft. ; 20,000 tons ; Speed, 21 knots ; Completed, 1910 ;
North Dakota } Armament, 10—12 in., 14—5 in., 2—3 in. A.A., 16 small.

Florida } Length, 510 ft. ; 21,825 tons ; Speed, 21 knots ; Completed, 1911 ;
Utah } Armament, 10—12 in., now 12—5 in., 19 smaller and A A.

See pages 331, 333, 335.

Michigan. **South Carolina.**



Length, 450 ft. ; 16,000 tons ; Speed, 18·8 knots ; Completed, 1909 ;
Armament, 8—12 in., 14—3 in., 2—3 in. A.A., 6 small.

See pages 332, 334.

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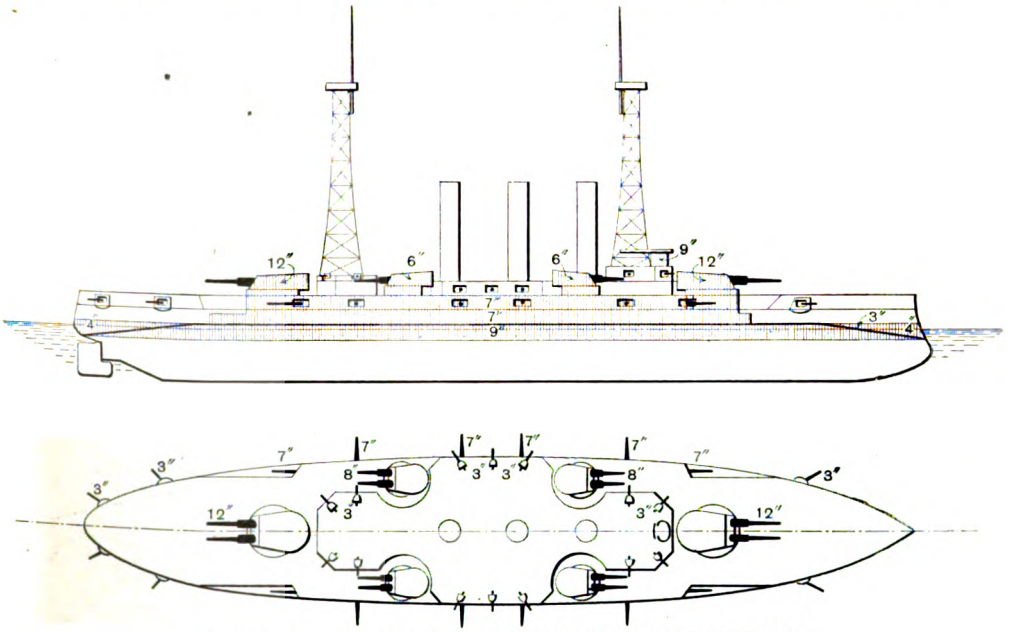
UNITED STATES.

BATTLESHIPS.

Connecticut. Kansas. Louisiana. Minnesota. New Hampshire. Vermont.

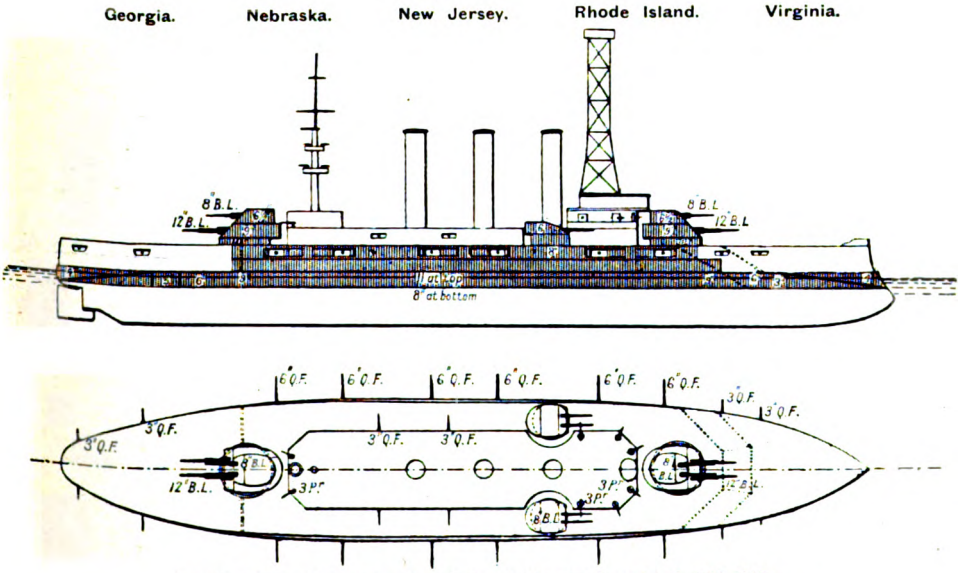


Length, 450 ft. ; 16,000 tons ; Speed, 18·1—18·8 knots ; Completed, 1906–1908 ;
Armament, 4—12 in., 8—8 in., secondary armament changed and A.A. guns added.

Connecticut and Louisiana have 11-in. belt instead of 9 in., and have only 2—3-in. guns at the stern New Hampshire has two military masts in place of the towers. Minnesota has one mast and one tower.

See pages 331, 332, 333, 335.

Georgia. Nebraska. New Jersey. Rhode Island. Virginia.



Length, 435 ft. ; 14,948 tons ; Speed, 19—19·4 knots ; Completed, 1906–1907 ;
Armament, 4—12 in., 8—8 in., secondary armament changed and A.A. guns added.

See pages 331, 333, 334, 335.

PLATE 75.

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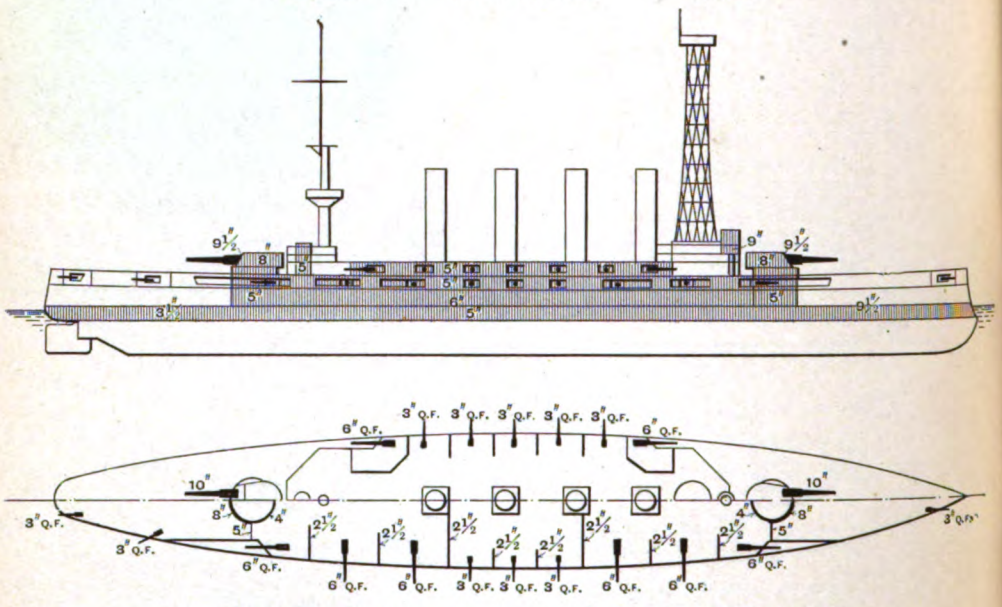
UNITED STATES.

ARMOURED CRUISERS.

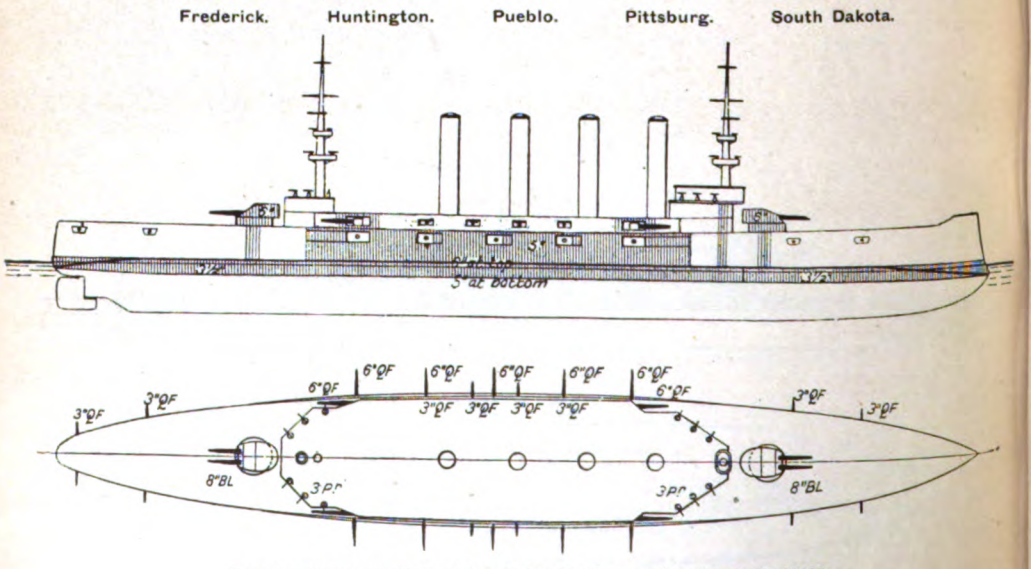
Montana. **North Carolina.** **Seattle.**



Length, 502 ft. ; 14,500 tons ; Speed, 22—22·5 knots ; Completed, 1906–1908;
Armament, 4—10 in., 4—6 in., 12—3 in., 4—3 in. A.A. 17 small (new armament).

See pages 333, 334, 335.

Frederick. **Huntington.** **Pueblo.** **Pittsburg.** **South Dakota.**



Length, 502 ft. ; 13,680 tons ; Speed, 22—22·4 knots ; Completed, 1905–1907 ;
Armament, 4—8 in., 4—6 in., 10—3 in., 28 small and A.A. (new armament).

See pages 331, 332, 334.

PLATE 76.

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PART III.

ARMOUR AND ORDNANCE.

ORDNANCE TABLES.

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PART III.

ORDNANCE AND ARMOUR.

In part III of the *Naval Annual* of 1916 it was stated that "Nothing can be written here relating to the progress made in the scientific development or production of Naval Ordnance in Allied Countries. As is well known, extraordinary energy has been thrown into everything that relates to the provision of armaments, and, very great difficulties having been surmounted, the output is now enormous. A great number of factories have been brought under Government control and in every part of this country operations are proceeding at full blast." Since the above was written great things have been attempted and accomplished, not only in Government Departments but by all the principal Ordnance manufacturers of this country, and this chapter will review, and illustrate where possible, some of the most interesting Ordnance developments which have been employed in the British Naval Service during the past four years. It is not possible yet to get reliable data of correspondingly original work done in the Allied countries, and it is equally, if not more, difficult to get information from enemy countries as to the advances made by them.

New elements in warfare.

So rapid was the development of the German submarine programme, and so relentless and ingenious were their methods of attacking not only ships of war but those of the passenger and merchant services, that on several occasions there was cause for great anxiety. The vast use which the enemy made of the submarine mine, and the great ingenuity which they exercised in the means of laying the mine-fields and distributing the mines, also seriously menaced our vast shipping traffic for the supply, not only of the necessities of war, but of foodstuffs for this and Allied Countries. Added to these difficulties there were also those arising from the extensive use made of aircraft. All of these new elements necessitated a new order of study owing to the urgency of neutralising the advantages which the enemy would otherwise have gained by the employment of these new methods of warfare. Quick decision in the

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selection of the means to be employed to repel these new methods of attack was demanded, in order particularly that we might be furnished with the requisite amount of anti-submarine, anti-mine and anti-aircraft devices.

Check-mates.

It was necessary, not only to provide Naval escorts for certain classes of shipping, but to arm practically every merchant ship with anti-submarine weapons. A very large number of armed small craft of all types were collected and distributed for service in connection with the various coastal bases. These had to be supplied with specially designed guns and mountings. An altogether novel species of weapon was introduced into the Navy in the form of bomb or depth-charge throwers, and guns to throw projectiles relatively short distances. These guns were of varied types and calibres and in many cases of simple construction, so as to enable them to be turned out rapidly and by firms without great experience in ordnance manufacture, for the armament of trawlers and merchant ships. Means had to be quickly devised for detaching mines from their anchorage and bringing them to the surface, there to be destroyed. Improvements were made in the fire control of the larger ships, sighting gear, projectiles, etc. In fact, there is no department of Naval Ordnance which has not received the closest study and development, and a host of new inventions and devices were brought out, and applied for the defeat of our enemies, with an astonishing rapidity, both in design and manufacture. It is not possible, even were it prudent, to describe in detail all these inventions, most of which proved thoroughly effective in helping to achieve victory, but some particulars and illustrations will be given later in this chapter of various improvements and new types of material.

Gun range.

The improvements since 1914 in guns and ballistics have been principally in the direction of increasing ranges and accuracy. This increased range is best shown by the fact that in the Russian-Japanese War the maximum effective battle range was considered to be 6000 yards, as pointed out in the *Naval Annual* in 1907. Before the war it was 9000 and 10,000 yards, yet at the Jutland battle fighting commenced at 20,000 yards.

How attainable.

Increase of range for any particular gun can be obtained in four ways:—

(1) by altering the shape of the projectile,
(2) by increasing the elevation of the gun,
(3) by increasing the muzzle velocity,
(4) by a combination of all or any two of the above methods.

Shape of projectile.

The first method has been extensively employed. Instead of a

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blunt nose cap being simply placed on the point of the armour piercing shell, it has been made to conform and blend with the outline of the projectile; the radius of the head has been increased from the usual 2 cal. to 4 and 6 cal., and by means of false noses or wind screens this radius of head has been increased to 8 or 10 cal. The gain in range, due to the change of the shape of the projectile alone from 2 cal. rad. to 4 cal. rad. or from 4 to 8, is roughly about 15 per cent. at a muzzle velocity of 2500 f.s. depending upon the cal. of the gun.

Greater elevation of gun.

Greater increase in range, however, is obtained from the radical increase in elevation, which in several cases has been carried out. For example, an addition in elevation from 15 degrees to 30 degrees in the case of the 15-in. gun results in an increase in range of from 40 to 50 per cent. The higher elevation gives an increased angle of descent, which in the neighbourhood of 30 degrees elevation is about 45 degrees. This fact renders it possible, on occasion, effectively to penetrate the existing deck and roof plates, but militates against the penetration of side armour.

Higher muzzle velocity.

Increase of muzzle velocity is not easily obtained in an existing gun and mounting, due to the consequent increased stresses. At the same time it is fundamentally undesirable as it shortens the life of the gun, owing to increased wear and erosion. These latter troubles are already serious enough.

Most effective method of increasing range.

Progress with regard to increase of range has therefore been made along the lines of (1) and (2). This increase of range and consequent increase in the dispersion of projectiles requires improvement in accuracy and control of fire. Accuracy in the gun is obtained by reducing the wear from round to round as much as possible, and using guns not too greatly worn, and further by ensuring that variation between the projectiles is the least possible. With this end in view, reduced tolerances of weight and dimensions have been introduced. The allowance on weight of armour-piercing projectiles is now only $\frac{1}{10}$-th of 1 per cent.

German gun elevations.

It must be admitted that the Germans seem to have realised more fully than our authorities the advantage of high elevation in their primary guns towards increase in the effective range, as well as the need for improved range finding with the assistance of airships. Practically all the German naval guns, great and small, were ranged for elevation up to 30 degrees, whereas the British guns, in many cases, only elevated to 15 degrees or 20 degrees. This, of course, gave a greatly increased range, roughly, as already stated, from 40 per cent. to 50 per cent., so that early in the war in many cases our guns were out-ranged by those of the German ships. Arrangements

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were, however, very soon made to increase the elevation and range of our guns; but this was a great undertaking in the case of the larger guns and took a great deal of time and involved extensive mechanical and structural alteration. The danger of plunging shot, and the risk of penetration of the decks and horizontal protection generally became much greater relatively to the risk of penetrating the vertical side armour, to which in former designs the chief attention had been paid. Frequently shell came down at an angle of 25 degrees or even 30 degrees to the horizontal, and after the Battle of Jutland it was generally accepted that the danger of plunging shell penetrating the vitals of a ship demanded an increased protection over the magazines, and it was arranged to increase the deck protection accordingly in all our modern capital ships.

The torpedo and under-water protection in war-ships.

Here also it may be interjected that the improvement in the efficiency of the torpedo, and the great increase in range obtained with this weapon, in association with the activity of the submarines, pointed to the necessity of improving the under-water protection of ships. Before the war a series of experiments had been conducted and great improvements had been made in the under-water protection, and the efficiency of these improvements was shown when the Marlborough was torpedoed at the Battle of Jutland, yet remained for a considerable time in the line and continued the action, and was finally safely brought into port. The damage she sustained was, however, somewhat serious, and would probably have sunk a ship with anything less efficient in the way of protection. Immediately the war began Sir E. H. Tennyson d'Eyncourt, K.C.B., the Director of Naval Construction, put forward proposals for "bulge" protection to ships. Experiments were made, and his ideas proved to be correct. Bulges were fitted to some of the old cruisers of the Endymion class and also to the new large monitors mounting heavy guns. This protection consisted of a watertight outer compartment full of air and an inner compartment open to the sea and therefore full of water. It was a long time before any vessel fitted with this arrangement was actually torpedoed; but later, several vessels fitted with these bulges were torpedoed and survived. A somewhat improved form of bulge, but the same in principle, was also tried and proved efficient.

Protection by "bulges."

No bulged ship hit by a torpedo has ever been sunk. It may be taken, therefore, that this has been accepted in principle as the best form of under-water protection, and is likely to be adopted in the future. The actual results show that this form of protection makes a ship equally safe against torpedo attack under water, as any of the modern armour which can be fitted makes the ship safe against

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above-water attack from guns. This is certainly a considerable achievement, but naturally the arrangement adds greatly to the weight of the structure of the ship as a whole and tends to reduce the speed. It has been found, however, that if the form is "moulded" with care, the loss of speed is very small, and in fact with ships of ordinary proportions, no greater loss of speed is entailed than that due to the increased displacement brought about by the additional weight of the bulge. One very important benefit of the bulge is that the gases generated by the explosion of the torpedo to a large extent vent themselves in the air immediately above the damage instead of venting themselves inside the ship, as is necessarily the case when the protection is internal and the explosion gets well into the hull proper. Both the above considerations, viz., the increase of horizontal deck protection against plunging gunfire and the under-water protection, add very considerably to the total weight of protection which it is necessary to carry to make a modern capital ship in any way secure against attack, so that the tendency for bigger ships goes on, as ever, increasing. Deck protection also grows in importance as attack from the air becomes more threatening.

Anti-aircraft guns.

To return to armament, there has been increase in calibre of anti-aircraft guns. The largest of these in use in the Navy at the commencement of the war was the Vickers 2-pdr. 40 mm. automatic gun. The calibre has gradually been increased, until now a gun of 4-in. cal. and firing a projectile of 35 lb. is not considered excessive. Even greater progress than this has taken place in the increase of power of guns mounted in submarines.

Merchant ship anti-torpedo guns.

In connection with the development of hand-worked gun mountings for the secondary armament, and the armament for the smaller types of ships, merchant vessels, etc., the greatly increased range and accuracy of the torpedo, coupled with the destructive power of the submarine, rendered it absolutely essential to have this class of gun mounting brought to the highest state of efficiency and arranged so as to be readily and quickly manipulated. This question has been given the closest study with the result that the hand-worked gun mountings have been brought to a very high state of excellence; every part of the equipment has received most careful consideration, particularly the sighting, elevating, training and loading mechanisms, along with the recoil and counter recoil gear.

Primary armament of war-ships.

As regards calibre of the guns in the main armament of ships, it is gratifying to discover that the British ships far outclassed the German ships. Time and again there were rumours to the effect that the Germans were substituting in existing ships guns of larger calibre; but it is now officially stated that the only 15-in. guns

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fitted were the eight in each of the two new ships completed during the war and corresponding to our Queen Elizabeth class, whereas in British ships completed during the war we had 100 of 15-in. cal., ten of 14-in. cal. (in the Canada taken over from the Chilian Government), and twenty of 13·5-in. cal. Table I is taken from the paper read at the Institution of Naval Architects on April 9th this year by Sir E. H. Tennyson d'Eyncourt. It deals only with British and German ships, no account being taken of our Allies' fleets or with the ships of Germany's allies. It does not include the 12-in., 14-in., 15-in. and 18-in. guns of our monitors, and as Germany had no such vessels, our preponderance is greater and reflects higher credit upon our armament firms. Only battleships and battle-cruisers are taken into account.

TABLE I.—NUMBER OF GUNS OF MAIN ARMAMENT ON BRITISH v. GERMAN BATTLESHIPS AND BATTLE-CRUISERS—DREADNOUGHTS AND LATER SHIPS ONLY.

	August 4, 1914. (Outbreak of war.)		Added during the war, less losses.			
			Up to May 31, 1916. (Battle of Jutland.)		Up to November 11, 1918. (Date of armistice.)	
	BRITISH.	GERMAN.	BRITISH.	GERMAN.	BRITISH.	GERMAN.
15-in. . . .	—	—	64	8	100	16
14-in. . . .	—	—	10	—	10	—
13·5-in. . .	124	—	28	—	20	—
12-in.) 11-in.) . . .	148	184	14	48	minus 12	56
Total . . .	272	184	116	56	118	72
Weight of Broadside lb.	279,100	116,600	190,340	52,840	226,600	77,500

The table shows that at the beginning of the war we had in our capital ships, Dreadnoughts and battle-cruisers, 272 big guns against 184 in German ships. Our total broadside was 279,000 lb., and that of Germany 116,600 lb. By the end of the war we had added 100 15-in. guns, besides 14 in., 13·5 in., etc. (with a net addition of 226,600 lb. broadside), against sixteen of 15-in. calibre and fifty-six of 12-in. calibre, with a broadside of 77,500 lb. added to the German Navy.

We began with an advantage of 140 per cent. weight of broadside. At Jutland we had an advantage of 175 per cent. weight of broadside, but if two ships of Royal Sovereign type only just commissioned are not counted, this percentage becomes 160. At the finish of the fighting we had an advantage of 160 per cent. weight of broadside.

As to the disposition of guns in the ships there has not been any

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material change. That only six guns were mounted in the battle-cruisers Repulse and Renown—two pairs at different levels forward and one pair aft—is due to the fact that mountings for this number of guns were in an advanced state of construction and available for these ships, which were urgently needed for the Fleet. On this point of gun disposition an interesting historical fact regarding the origination of the idea of the all-big-gun ship, with concentration of fire at the maximum number of points of the compass, was brought out in Sir Philip Watts' paper, read at the Institution of Naval Architects on April 9th of this year, and should be put on record in the *Naval Annual*. Sir Philip was referring to the old Devastation of 1871, designed by the late Sir E. J. Reed, and the Inflexible of 1881, designed by the late Sir Nathaniel Barnaby. The former had a two-gun turret forward and aft, the latter two twin-gun turrets amidships *en échelon*. Captain (now Lord) Fisher was associated with the building of the latter, and had command of her at the bombardment of Alexandria. Sir Philip went to sea in both ships to study their performance. Discussion had taken place in connection with the gunnery trials as to the relative values of the right-ahead fire, the broadside fire, and the arcs of training in the Devastation and Inflexible arrangements of armament. This discussion was continued by Lord Fisher and Sir Philip Watts on board the Inflexible, and when the latter left the ship before the bombardment of Alexandria he took away with him an outline design which had been evolved during the cruise, and which was described as a combination of the Devastation and Inflexible designs. The armament was an all-big-gun armament of four pairs of 16-in. 80-ton guns, mounted in turrets, all placed on the upper deck; one pair at each extremity of the vessel on the middle line as in the Devastation, and one pair placed on each broadside *en échelon*, as in the Inflexible. Thus one pair of guns had direct ahead fire, with an arc of training from well abaft the beam on the starboard side to well abaft the beam on the port side; one pair of guns had a direct astern fire, with an arc of training from well before the beam on the starboard side to well before the beam on the port side; the pair of guns mounted in the starboard *en échelon* turret had an arc of training on the starboard beam from nearly right ahead to nearly right astern, and a considerable arc of training on the port beam, one gun of this turret also being capable of firing directly ahead and the other directly astern; the fourth pair of guns in the port *en echelon* turret had an arc of training on the port beam from nearly right ahead to nearly right astern, and a considerable arc of training on the starboard beam, one gun of this turret also being capable of

Disposition of guns in capital ships.

The origin of the all-big-gun ship.

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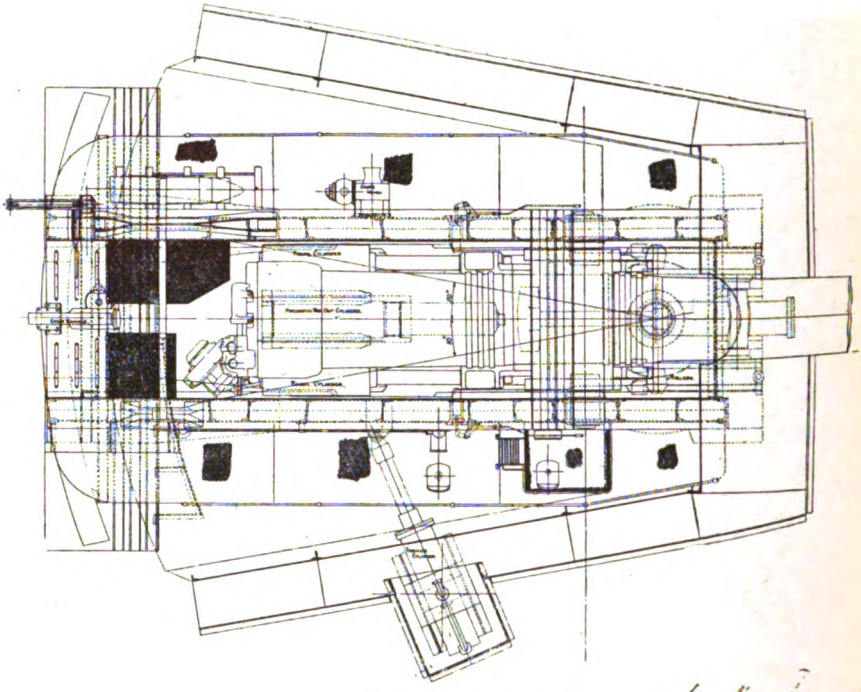
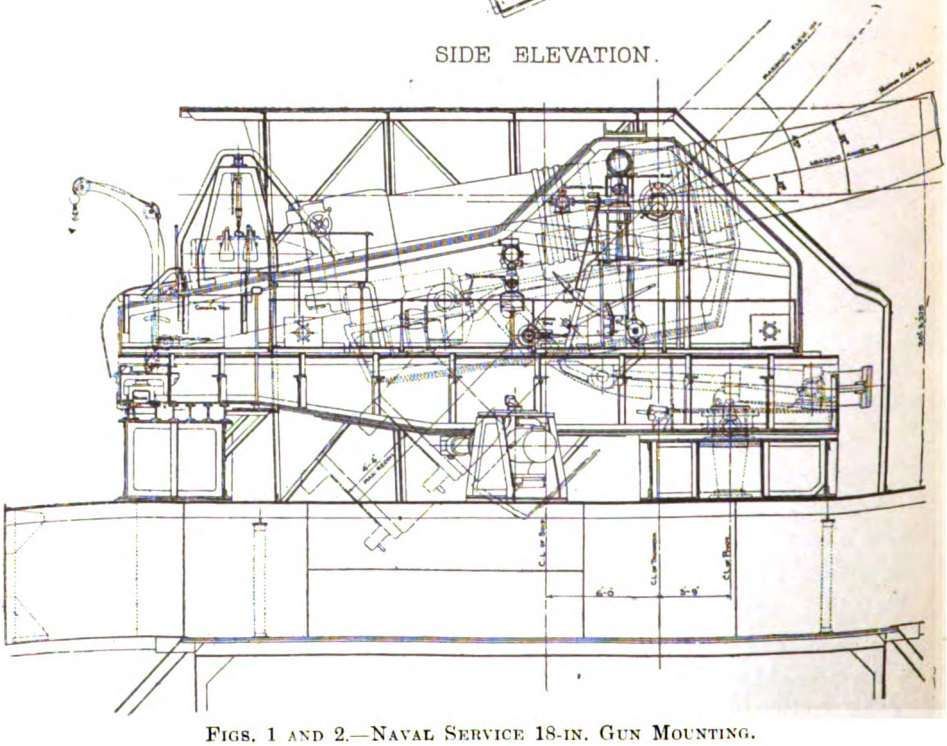
PLAN VIEW



SIDE ELEVATION.



FIGS. 1 AND 2.—NAVAL SERVICE 18-IN. GUN MOUNTING.

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firing directly ahead and the other directly astern. Four big guns could always be brought to bear on any target right ahead or right astern, or on either bow or either quarter; and on the beam six big guns could always be brought to bear, and sometimes eight, on any target, and over a certain angle eight could be brought to bear. The scheme involved a displacement of 16,000 tons, and was considered inadmissible by Sir Nathaniel Barnaby on this account. It was only when Lord Fisher was in a position of supreme importance at the Admiralty that this idea of gun disposition was carried into effect.

As Sir Philip Watts stated in the same paper, Lord Fisher later brought with him from the Mediterranean several designs of warships, amongst them a design of an all-big-gun battleship, having

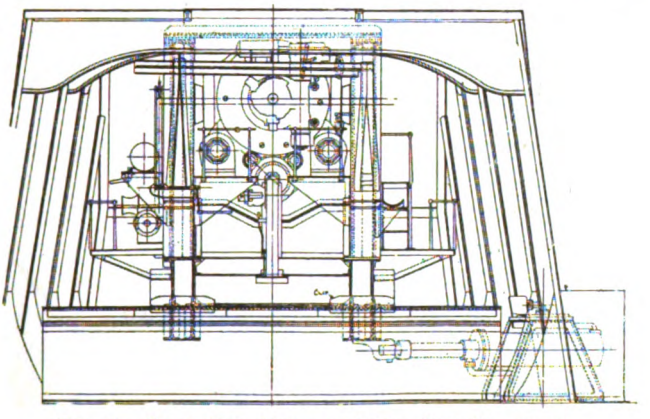

FIG. 3.—REAR END VIEW OF 18-IN. GUN MOUNTING.

six pairs of 12-in. guns, all mounted on the middle line, three on each end of the vessel in successive tiers, one close behind the other, so that six guns would fire directly ahead and six directly astern. Those behind fired over those in front, and all twelve guns could fire on either broadside with a considerable arc of training respectively abaft and before the beam. These designs were considered by Lord Fisher's Admiralty Committee, which resulted in the construction of the Dreadnought, although it was a year or two before money enough was voted per battleship to enable guns at different levels to be adopted.

Our 18-in. guns.

The largest Naval gun fitted to any ship during the progress of the war is the 18-in. gun, and the mounting for it is illustrated on this and the opposite pages. The 18-in. Naval guns, together with their mountings, were built by the firm of Sir W. G. Armstrong, Whitworth & Co., Ltd., and were installed in the first instance in the Furious. When that battle-cruiser was converted to an

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aeroplane carrier the guns and mountings were removed. New mountings were designed and constructed for these 18-in. guns, and specially arranged to be mounted singly on board the monitors Lord Clive, General Wolfe, and Prince Eugene. It is this arrangement which is illustrated on pages 380 and 381. The design was specially developed to allow for ease in erection, and only eight months was taken from the commencement of the design to the completion of the first proof. This entailed transportation right across England, and the erection of the gun and mounting on the proof ground.

Single 18-in. gun mounting for monitors.

These mountings are arranged to allow of an angle of elevation of the guns of 45 degrees, and to admit of about 20 degrees of training. Owing to the large size of the mountings, and the limitations in size of the after-part of the ships to carry them, it was necessary to place the axis of the gun and mounting athwartship. When it is desired to fire beyond the arc of training allowed for in the mounting, the ship is manœuvred to bring the target within the arc of training of the mounting. A large screen or shield, fixed to the ship's deck, entirely covers the mounting.

Hydraulic power is supplied to work the principal gears on the mounting, viz.:—(1) For elevating the gun; (2) For training the mounting; (3) For operating the breech; (4) For lifting the shell; (5) For ramming the shell. The remaining operations, such as traversing the shell on the overhead loading rails, lowering the shell on to the loading tray, inserting the locking bolts at the loading position, are all performed by hand power.

There being neither shell rooms nor magazines built at the after-part of the ship for the stowage of the ammunition, special arrangements had to be made for this purpose. The shells are laid on trays placed along the after deck, and conveyed by hand-worked runners and traversers to a hatchway at the rear of the mounting, through which they are lifted to the shell waiting tray by means of the hydraulically operated lifting crane. The weight of each shell is 1½ tons.

The cordite is stowed in tubes in specially constructed tanks, arranged near the mounting on the forecastle deck, and as the tanks are exposed to the weather, special provisions have been made to maintain the cordite at the requisite temperature. To this end warm water is allowed to circulate through the tanks, the circulation being maintained by means of a steam heater. The cordite is taken from the tanks and placed in bogies, which run on rails on the forecastle deck for transport to the mounting, the rails forming a complete circular track, so that when a bogie is emptied at the mounting it is run forward to be recharged.

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It may be of interest to note that these monster weapons were used during the final bombardment of Ostend, and it is satisfactory to know that, in range and accuracy, their performance was specially good.

Another feature of this Naval mounting is, that it is adapted for transport to, and erection in, a land emplacement.

Twin 12-in. gun mounting in battleship.

A mounting for a pair of 12-in. guns, possessing several novel features, is illustrated in Figs. 4 and 5, on pages 384 and 385, while one of the novel features is illustrated perspectively in Figs. 6 to 9, on page 387. This is a gun mounting for the Agincourt, which carries a main armament of fourteen 12-in. guns, mounted in pairs in turrets. This ship was originally named the Rio de Janeiro, having been built by Sir W. G. Armstrong, Whitworth & Co. for the Brazilian Government, from whom she was purchased by the Turks shortly before completion in 1914. She was taken over by the British Government on the outbreak of war in August, 1914.

In the design of the main armament mountings many improvements were introduced. The improvements lie mainly in the direction of rapid working, but combined with this is economy of men and simplicity of operation. With earlier 12-in. or 13·5-in. mountings it requires a very well drilled crew to load a gun in thirty seconds. This speed of working can hardly ever be maintained. But with the present mounting there is no difficulty in loading in twenty seconds. Indeed, during a trial of endurance the loading operations were gone through two hundred times with a resultant average of nineteen seconds.

The main feature of the mounting is that one lever works all the machinery in the gun-house, and thus replaces four levers. The one lever performs the various operations in rotation by working round the four sides of a square, the motion along each side performing a distinct and separate operation—first, opening the breech; second, placing the gun in the loading position; third, raising the gun loading cage; fourth, working the rammer. Then, by reverse motions, withdrawing the rammer, lowering the cage, etc. In previous existing mountings these operations are all performed with different levers, while another lever to bring the cordite charge in position for ramming is also fitted. From the explanation which follows it will be seen that the last-named lever is not required in the new mounting.

Although all the four motions mentioned above are worked by one lever, it must be clearly understood that the machinery corresponding to each motion is always under control, and can, if necessary, be stopped or reversed at any moment. But, although a separate motion of the lever is required for each operation of the machinery,

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the valves working the machinery are so designed that no motion of the machinery which is dependent on a preceding motion can take place until that motion is complete. The result of this interlocking

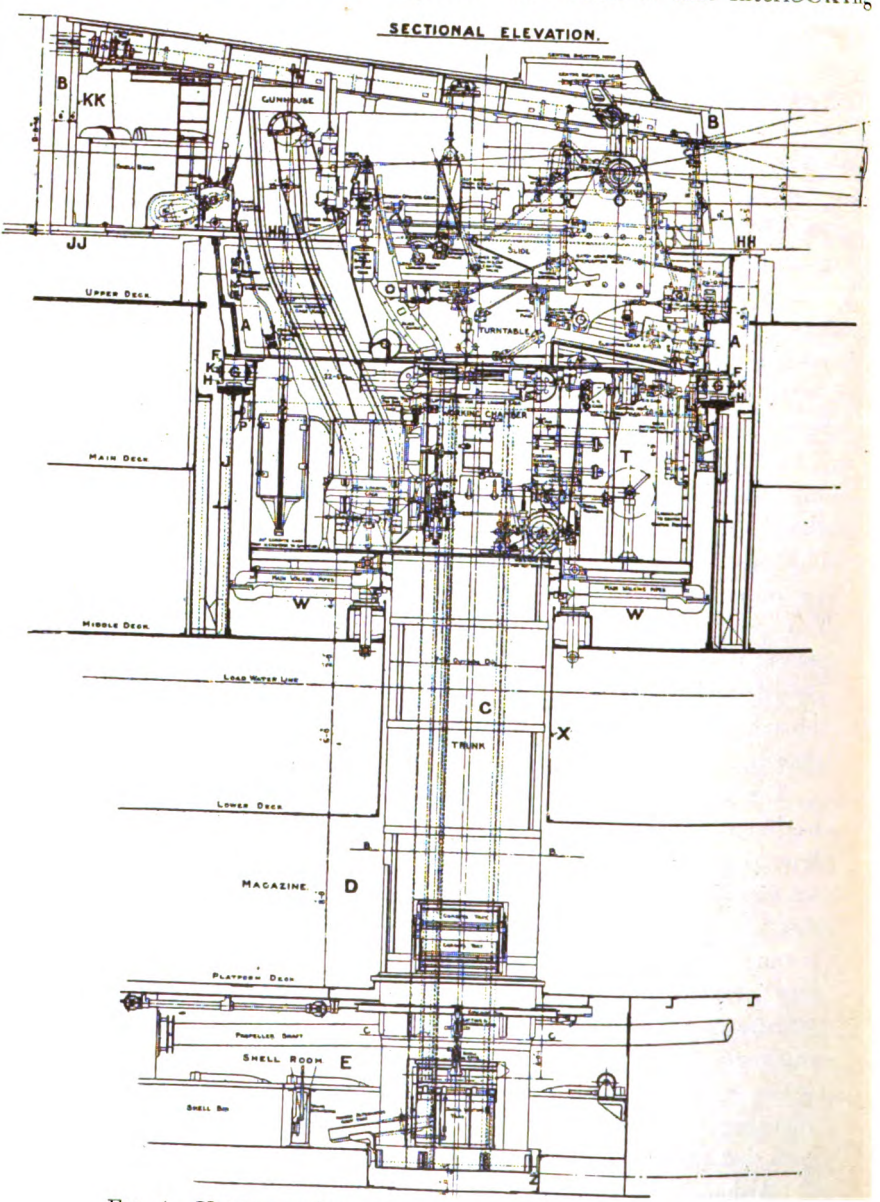

FIG. 4.—HYDRAULIC INSTALLATION FOR A PAIR OF 12-IN. 305 MM. 45 CAL. B.L. GUNS.

is, that it is impossible to work the single lever too quickly, or for an accident to happen. This lever is called the master lever because,

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as a matter of fact, it engages with any one of the four other levers, and it is the latter which opens the valves, but it is also known as the "churn" lever. Drawings cannot be given, but it will not be difficult to make the action, which is extremely simple, clear by words only. By a study of Fig. 6, for example, it will be seen that the master lever stands inside a square box. The lever is pivoted at the centre of the bottom of this box in a universal joint. On each side of the box, inside, there is another lever, four in all, each controlling a separate valve. These levers are pivoted near the bottom. In their upper ends are oblong holes. On the master lever is fashioned a strong cross, each projection of which can engage

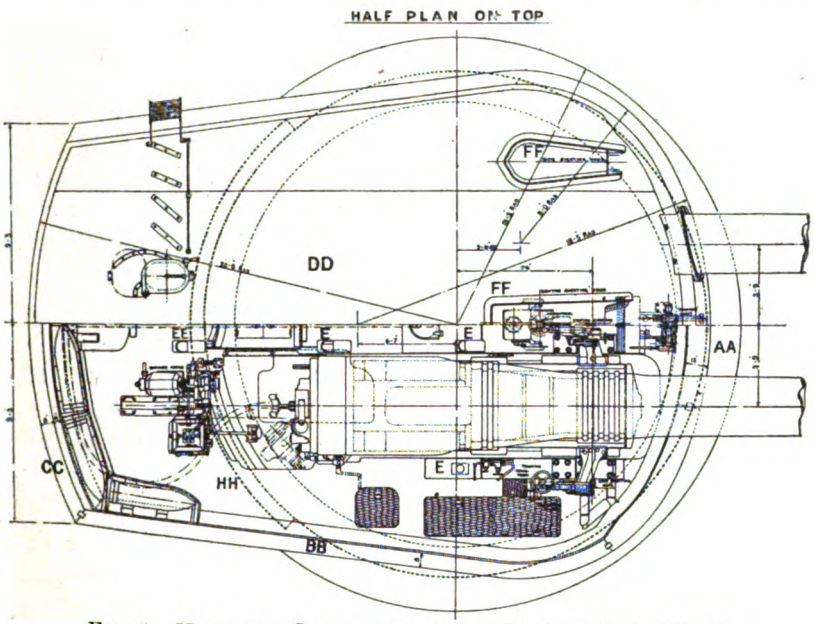

FIG. 5.—HYDRAULIC INSTALLATION FOR A PAIR OF 12-IN. 305 MM. 45 CAL. B.L. GUNS.

with the hole in one of the lever heads. The cross on the master lever is engaged with the head of a lever on the side of the box nearest the spectator. Thus, when the master lever is moved from right to left, it pulls this lever over with it and opens a certain valve. Reaching the left hand position, another arm of the cross engages with a lever standing up on the left side of the box. When, then, the master lever is pulled backward along the second side of the box, it leaves the first valve lever in its left-hand position and draws the second valve lever backwards; at the third and fourth corners the cross on the master lever engages with third and fourth valve levers in the same way.

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Concentration of control.

It will be observed that by this simple arrangement each valve lever is left in position for the return of the master lever, which moves them one by one to their original position as it is pulled backwards, pushed to the left, pushed forward, and pushed to the right in turn. One other point need only be mentioned. The inside top edges of the "box" are turned down and engage with upturned lips on the master lever. Thus, once the latter has moved from a corner, it is held in engagement with the proper valve lever, and cannot leave it until another corner, where the downward lip of the box is cut away, is reached. By this very simple arrangement it is impossible to move the master lever in any way except round the four sides of the square, and hence it is impossible to open any valve out of its proper order. It is clear also that it is impossible to do anything that would disturb the right sequence of events.

Although one lever controls the different operations in sequence, arrangements are made so that any operation may be performed separately and without any reference to any other. This provision is made specially for cases of examination or repair. It would never be required for ordinary working of the gun mounting as a whole. It is effected by moving any one of the valve levers by hand.

The gain in rapidity of working is due mostly to the fact that there is a single operator at the "churn" lever, who need never be delayed by having to think of what he has next to do, or wait for someone else to complete another operation. Any man at all versed in working heavy guns can, without training to this special mounting, work its single lever and load the gun as rapidly as another man who may have worked it for a long period. We may avoid saying that machinery takes the place of brains, but it will certainly render the working of those brains much more easy at times of difficulty, as, for instance, during the stress of battle.

The mounting is designed for loading at a fixed angle of elevation. The advantages and disadvantages of this condition are matters of controversy, but the principal features are just as suitable for "any-angle loading" as for "fixed-angle"; and, indeed, nearly all the details have been fitted to a mounting designed for the former, but the design is perhaps more simple and attractive with "fixed-angle loading" than it is with "any-angle loading." One important advantage of fixed-angle loading should be mentioned. It is now an invariable practice to use water after each round in addition to the air blast for expelling gases, and if the refinements of correction to sights on account of temperature and atmospheric conditions be considered, it seems strange that greater variations in range due to the possibility of a considerable amount of water remaining in the chamber should

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be neglected in a mounting which can be loaded at any angle of elevation. The fixed-angle of loading selected is 5-degrees elevation, so that all water may run out of the chamber.

The "churn" lever is placed on the platform in rear of the gun, whence the operator can see the result of every motion he controls. He stands behind it, facing the breech of the gun, *i.e.*, he would be facing the reader in Fig. 6. The following are the motions required:— (1) Open the breech. (2) Place the gun at loading angle. (3) Raise the gun-loading cage. (4) Ram shot. (5) Withdraw rammer. (6) Ram first half charge. (7) Withdraw rammer. (8) Ram second

The "churn" lever controlling all motions.

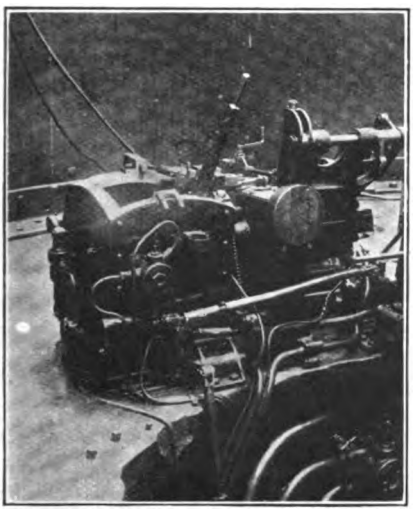

FIG. 6.—MASTER LEVER IN POSITION FOR OPERATING BREACH MECHANISM.

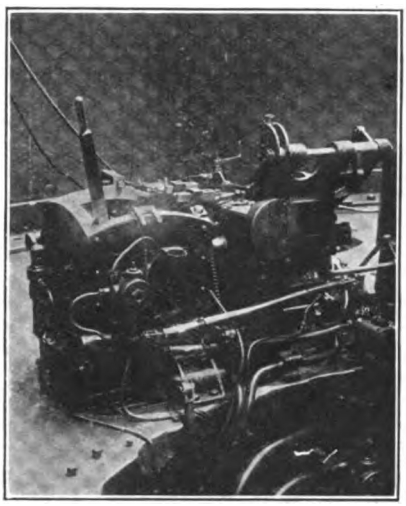

FIG. 7.—LEVER IN POSITION FOR PLACING GUN AT LOADING ANGLE.

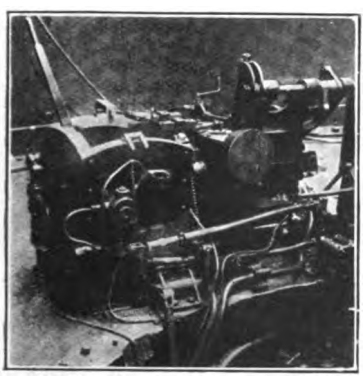

FIG. 8.—LEVER IN POSITION FOR RAISING GUN-CHARGE CAGE.

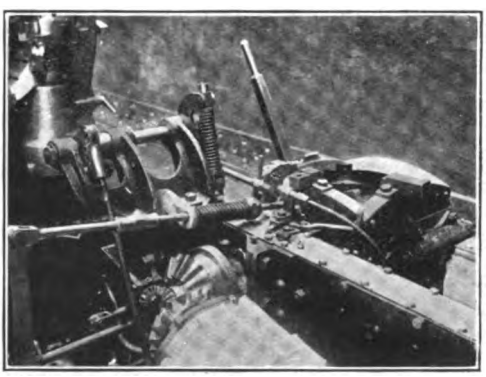

FIG. 9.—LEVER IN POSITION FOR ACTUATING RAMMER.

FIGS. 6 TO 9.—LEVER MECHANISM FOR CONTROLLING ALL MACHINERY IN GUN HOUSE WITH MOUNTINGS ILLUSTRATED BY FIGS. 4 AND 5 ON PAGES 384 AND 385.

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half charge. (9) Withdraw rammer. (10) Lower cage (to clear). (11) Free the gun from loading angle. (12) Close the breech.

Motion No. 1 (see Fig. 6). The lever is pulled from right to left or left to right in the same direction as the breech block swings.

Motion No. 2 (see Fig. 7). Placing the gun at the loading angle is reserved for the second motion, firstly, because it takes less time than opening the breech, and, secondly, because it is often convenient and never objectionable to open or close the breech without necessarily having to bring the gun to its loading angle. The mechanism for motion No. 2 is so arranged that the controlling lever has always to be pulled rearwards, whether the gun is above the loading angle or below it. Hence the operator has nothing to do but to pull the lever over to its full travel. The breech of the gun will then be raised or lowered automatically as necessary, and will finally come gently to rest. The moment the lever is worked for this operation, the pressure is shut off from the ordinary elevating valve used by the gun-layer so that he can no longer control the elevation. After loading, the lever, as it goes backwards round the square, operates the loading-angle valve before it closes the breech, thus the power to control the elevation of the gun is restored to the gun-layer whilst the breech is still open, and the time occupied in closing the breech "making ready" is ample to lay the gun. It ought, perhaps, to be mentioned here that the breech mechanism can be operated at any angle of elevation. No time is lost, for the turret trainer, with an independent sight, keeps the direction on during the loading. The gun-layer then simply lays his sights in the vertical plane without having to hunt for the target.

Motion No. 3 (Fig. 8). The loading cage may be brought up if it be properly loaded, and if the gun be in the loading position with the breech open, but it is necessary to provide safety arrangements to ensure that these conditions have been fulfilled. Therefore the lever cannot be put over to hoist the cage until a safety bolt in the lever orbit is removed by the man who loads the cage (in the working chamber below the gun-house), and even if the bolt be withdrawn and the lever put over, the cage will not come up unless the gun is in the loading position with the breech open, because automatic interlocking gear is provided to ensure these motions being complete before the hoist valve comes into action. Similar provision is also made to prevent the cage from coming up unless the gun is run completely out, the run out taking place automatically after recoil. It is well to mention here that the operator commences to work his churn lever directly recoil is finished, so that the running-out motion goes on at the same time as the breech is being opened. The gun-loading

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cage ought to be loaded in the working chamber before it is required for the loading, therefore the safety bolt ought to be withdrawn, allowing the operator to perform three motions of the churn lever without a check.

Motion No. 4 (Fig. 9). When the shot is in front of the rammer, the latter can be given a full stroke to force the shot home. To ram ammunition into the gun it is necessary to move the lever in the same direction as it is desired that the rammer shall work. But the lever cannot be moved forward unless the cage be up in position.

Motion No. 5 (the reverse of No. 4) withdraws the rammer. We must here anticipate the description of the ammunition cage by mentioning that it has three floors, on the lowest of which is placed the shot or shell, and on each of the others half a charge of cordite. During the last few inches of withdrawal the rammer head strikes and releases a pawl or catch, thus allowing the carrier in the cage to drop one stage and bring the first half of the cordite charge in front of the rammer head. At the same time a bolt (see Fig. 7) is protruded to limit the forward stroke of the lever—Motion No. 6—and thereby also the travel of the rammer, which now goes forward only far enough to place the half cordite charge just inside the gun-chamber.

Motion No. 7.—The lever is again pulled back, withdrawing the rammer again. The latter releases another pawl or catch, allowing a second dropping of the carriers, thus bringing the second half cordite charge into position.

Motion No. 8.—A further forward motion of the lever up to the stop rams in this half charge, pushing the first half charge in front of it, to the same limit, and the gun is loaded.

Motion No. 9 withdraws the rammer for the last time.

Motion No. 10, which is the reverse of No. 3, lowers the cage. During the last part of its descent the carriers are returned into position ready for recharging.

Motion No. 11, the reverse of No. 2, releases the gun from its loading position, as already explained.

Motion No. 12, the reverse of No. 1, closes the breech.

The loading cage is composed of two principal parts, which may respectively be called the containing frame and the sliding frame. The wire for hoisting the cage, with its usual safety gear to prevent the cage from falling if the wire breaks, is attached to the back of the containing frame, where are also the runners for engaging with the curved rails which guide the cage into position. The sliding frame, as already stated, is fitted with three carriers or trays, the lower one for the projectile, and the two upper trays each for a half charge of cordite. When the sliding frame is within the containing frame, it is held in

The loading cage.

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place by a pawl engaging successively with one of two stops. When the pawl is engaged with the lower of these the sliding frame is in position for the ramming of the projectile. When it is engaged with the upper stop the lower half charge is in position for ramming, and finally, when the pawl is withdrawn altogether, the upper half charge comes opposite to the rammer. The pawl can only be withdrawn by the rammer after it has travelled at least the full length of the carriers or trays. If, therefore, the rammer be given a short motion which has not pushed the projectile or half charge into the gun and entirely off the tray, the pawl holding the sliding frame is not withdrawn. Thus there is no possibility of the frame falling and catching a projectile or charge partly on the tray and partly in the gun. When the cage is lowered the sliding frame, which will be projecting downwards from the cage, first comes into contact with the structure in the working chamber, and, being arrested, the frame slides over and envelopes it until, the motion being complete, the pawl is again engaged with the lower stop. With the sliding frame thus placed the trays for the half charges of cordite are completely enclosed and the explosive entirely protected, but the projectile tray remains below the containing frame. A door on the front of the cage opens automatically only when the cage is in the position for receiving a charge from the central ammunition hoist. The chances of an accidental explosion are therefore reduced to a minimum. Moreover, doors on the side of the trunk in the working chamber remain closed until the cage is in position opposite them, so that a back flash in the gun-house cannot find its way down the trunk to the magazine.

Advantages of this form of gun-loading cage.

The advantages of this form of gun-loading cage are :—

(1) A lever, and one which is generally found rather troublesome to work, is entirely dispensed with.

(2) It is impossible to drop a cordite charge on to a moving rammer, an accident which cannot be said to be rare with previous types of gun machinery, and which causes grave inconvenience and delay, not to speak of some danger.

(3) The cordite charges, which are the most delicate element in connection with the working of heavy guns, are carefully treated instead of being allowed to drop through considerable spaces, as in cages of most existing types.

(4) Advantage (3) is combined with an avoidance of any uncertainty as to dropping into the correct position in front of the rammer, a matter of very great importance, especially in connection with loading at a considerable angle of elevation, when it is a fairly common occurrence with existing mountings for quarter charges to foul each other.

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The fall of the sliding frame is controlled by an oil buffer, so constructed that it cannot leak or require attention; it entirely prevents any blow or shock being given to the sliding frame as it falls. We have only to add that a cage of this design has been subjected to very severe trials, which have proved that it can be relied upon.

The central hoist bringing the ammunition from the shell-rooms and magazines to the working chamber is provided with means for securing the proper relative positions of the projectile and charge. At the bottom of the hoist the projectile receptacle has to be some 6 ft. or 8 ft. below the receptacles for the charges in order that the former may be conveniently loaded from the shell-room and the latter from the magazine handing room. But when the central cage is up the receptacles must be close together; in other words, during the motion of hoisting the shot receptacle must gradually approach the receptacles for the charges. This motion is obtained by a steel wire-rope purchase, so simple that it can hardly get out of order, and so little stressed that there is no chance of its breaking and very little of its stretching. Ready means for adjustment for stretch are, however, supplied, as well as the usual apparatus to prevent the cage from falling should the wire rope break.

The one lever principle is employed also in the working chamber for controlling the central hoist, and the rammer used for transferring the projectile and charges from the waiting trays to the gun loading cage. It is therefore impossible to hoist the central cage unless the rammer has been withdrawn.

There is one more fitting in this mounting which should be described. We allude to the combined tray and door in the shell rooms and magazine handing rooms used for the admission of the charges and projectiles into the central hoist. In previous mountings the fittings for this purpose have always taken the shape of a sliding door and a tray or bogie. The projectile was placed on the latter, and when it had to be transferred to the central cage the door had to be lifted, then stops were removed, and the projectile rolled down an incline into the cage. The new fitting consists of a door with a curved tray pivoted on brackets fixed to the trunk at each side of the opening. When in position to receive a projectile this door closes the aperture, but when the projectile has to be transferred to the central cage the tray is tipped up, swinging on a horizontal axis, which is so placed that the action of tipping does not appreciably raise the centre of gravity of the projectile. When the projectile is discharged into the cage the door returns to its original position, closing the aperture, under the action of a spring. The whole process of transferring a projectile from the tray to the cage can be done

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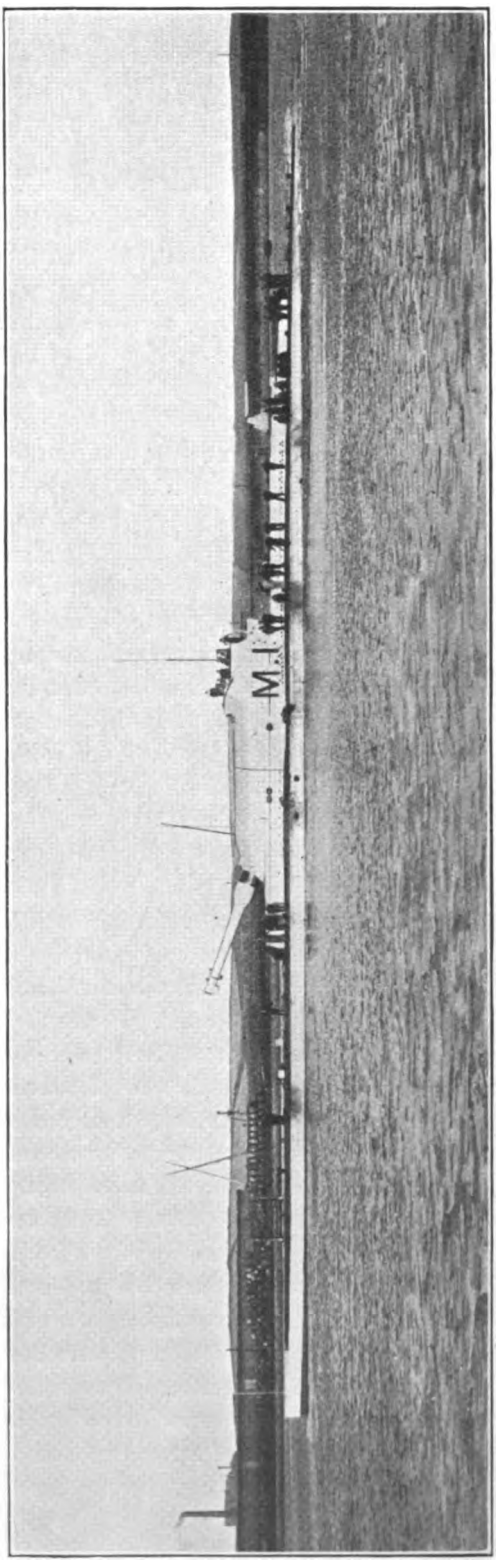

FIG. 10.—M SUBMARINE WITH 12-IN. GUN AND MOUNTING.

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in less than one second, and is effected by a lever at the side of the door.

Rapidity of fire.

If the ship were going into action, one charge would be in the gun, a second in the gun-loading cage, a third in the waiting position in the working chamber, a fourth in the central cage, a fifth on the tray, a sixth and a seventh on runners on the circular rail which feeds the tray. Therefore from each gun seven rounds could be fired without taking a single shell from the shell-room bays, and these seven rounds could all be discharged by a gun layer in less than three minutes. If the ship carried ten guns she could discharge seventy rounds in three minutes.

Sighting, elevating and training arrangements.

We will now turn to the sighting, elevating, and training arrangements which give precision to this formidable discharge. The right gun of the turret is elevated and fired from the right hand position, the left gun from the left hand position, and the turret is trained from a centre position between the guns. There is a second centre position from which either or both guns can be trained and elevated, but this is only a "spare" position. The gun-layer's sights call for no special remark, but his elevating lever is of interest. It works about a pivot below him, the lever standing vertically when the elevating control valve is centred. The gun-layer pushes the lever from him when he depresses the guns, or draws it towards him when he elevates. Exhaustive trials clearly demonstrated this motion to give the best results. These trials were carried out with a rolling practice platform, a rifle and a target. Levers and wheels of all descriptions were tried, but under every condition the vertical lever came out best. A lever also offers an advantage in that it is easy to apply a very simple firing trigger to the handle end, so that the gun-layer need not shift his hand to fire when he has adjusted the elevation.

The turret trainer is given a balanced telescope which is independent of any motion of the guns. It can be adjusted for deflection in the horizontal plane, and, being carefully hung in its pivots, the mere pressure of the face against the eyepiece with the help of a pad resting on the head and attached to an arm extending from the telescope is enough to control the telescope and keep it directed, however much the ship may roll. The trainer, therefore, has both his hands free to manipulate the training wheel, and is thus given every facility to keep his turret and its guns trained on the target.

The efficiency of the hydraulically operated mounting.

We have now followed all the operations of loading, aiming, and firing the guns. It will be noticed how admirably hydraulic power lends itself to the performance of the powerful but delicate duties it is called upon to perform in handling the large guns. In the present case, for example, nearly everything is done hydraulically, even the

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interlocking of the levers and valves, which is so essential to the safe working of the whole complex machinery. One of the little cylinders for working the releasing stops may be seen in the first three views of the churn lever. In this connection the total absence of lettered indicators in the mountings we are discussing should be noted. It is usual in mountings of this sort to see such indicators freely distributed to warn the operator that things are "ready" or "not ready," are "up" or "down," and so forth. In the new mounting the former "ready" and "not ready" form of indicator is replaced by definite stops, so that instead of the operator being told not to perform some operation, he is actually prevented from performing it. For the "up" and "down" class of indicator, of which there is only one required in the new mounting, the usual railway semaphore signal is used. This simple adaptation is a great assistance when construction of gun machinery for various nations, all using different languages and often difficult notation, has to be considered. In many cases the hydraulic power can be used by direct straight-line movement, as in the elevating gear and the shot hoists, in other cases, as for the rammer and so on, a rotary motion is required. In such cases a swash-plate hydraulic engine is employed.

12-in. guns in submarines.

A 12-in. mounting of an entirely different type to that just described is shown in Fig. 10 on page 392. It is the first big-gun mounting for use on board a submarine and carries a 12-in. Mark IX. gun. This has been successfully installed, and has again established the peculiarly good qualities of hydraulic mountings as against electrically operated mountings—a subject referred to in the *Naval Annual* of 1914—since it has been possible to train, elevate and load as well as actuate the run-out of the gun and work the breech mechanism without a man being on deck. In other words all control is from the interior of the ship without any of the operations in any way being hindered by the partially submerged condition of the boat; the gun, although loaded with powder charge and shell, can, in case of necessity, be rapidly submerged, the bore of the gun being made perfectly watertight. At the present time a full description of the mounting cannot be given, but the photograph reproduced indicates the general characteristics.

11-in. howitzer for attacking submarines.

A special Naval howitzer for the attack of submarines, also manufactured by Messrs. Vickers, is shown by Fig. 11 opposite. This 11-in. howitzer and its carriage are mounted on a roller path and are provided with training, elevating and sighting gear. The shell, which weighs 350 lb., is arranged to carry a large bursting charge of high explosive, and as the range to which the shell can be thrown is over 3000 yards it will be seen that this weapon formed a serious menace to the U-boats.

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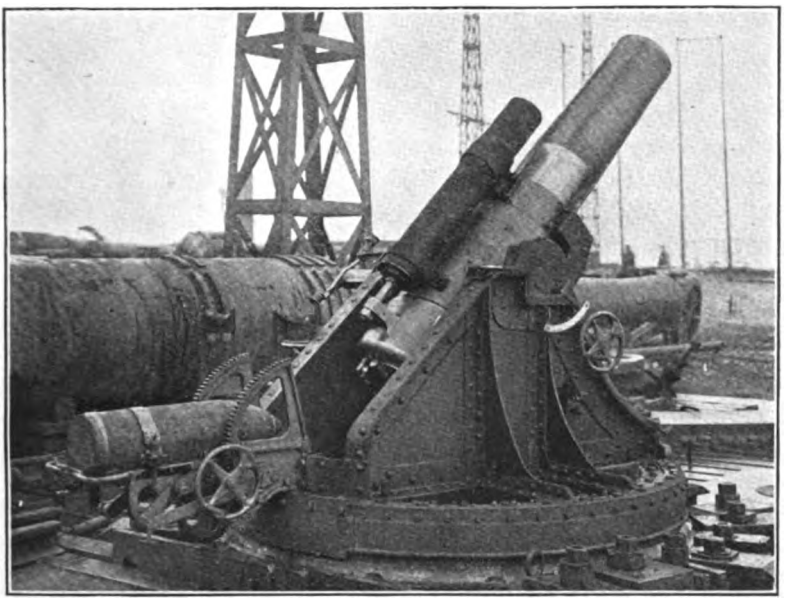

FIG. 11.—SPECIAL NAVAL HOWITZER FIRING 350-LB. SHELL.

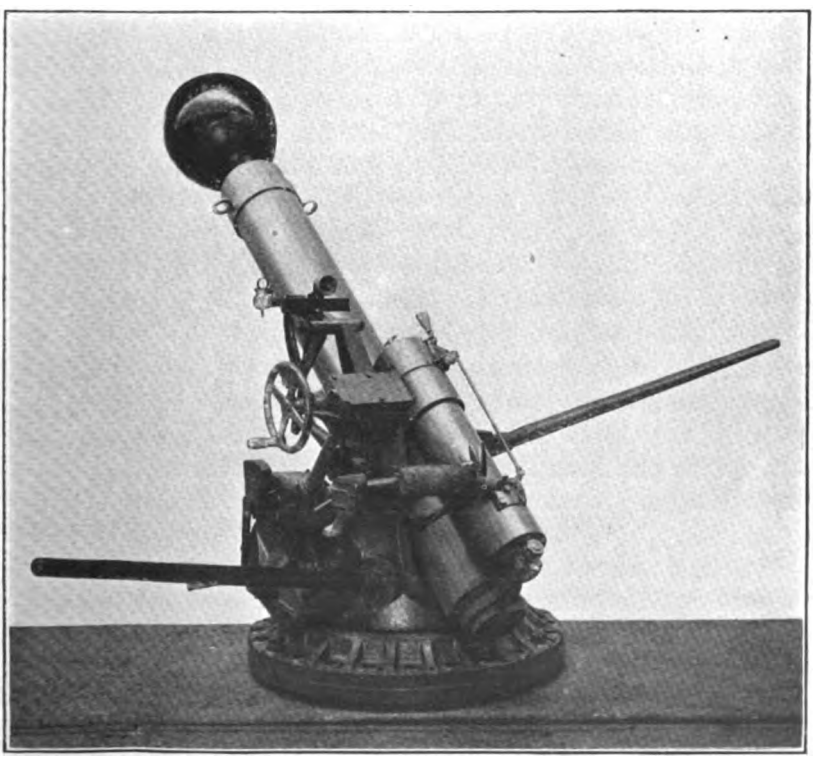

FIG. 12.—10-IN. MUZZLE-LOADING BOMB THROWER ON NON-RECOIL MOUNTING.

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10-in. M.L. bomb thrower.

Another and altogether different type of weapon is illustrated by Fig. 12 on p. 395. This is the 10-in. M.L. bomb thrower on non-recoil mounting. The stresses due to firing are so arranged as to allow of its being fitted in trawlers, mine sweepers, etc. The method of firing as applied to a gun is entirely novel. The propellant charge is ignited and burnt in a separate explosion chamber shown co-axially above the breech end of the gun. The gases are led from this chamber eventually to the rear of the bomb or shell. This gun fires an ordinary elongated projectile of 210 lb. weight a range of 1000 yards or a stick bomb of 500 lb. total weight to a range of 375 yards. The carriage is of the open back type made of cast steel. The gun is elevated and trained from the left-hand side of the mounting, a breast piece being provided for use in training. For the purpose of helping in the training of the gun when the ship is rolling, handspikes are provided on each side of the carriage. The angle of elevation of the gun is about 45 degrees and the angle of depression 5 degrees.

7·5-in. B.L. naval howitzer.

A similar though lighter type of weapon to the above is the 7·5-in. B.L. Naval howitzer which is shown in Fig. 13 opposite. The gun, however, differs in having a screw mechanism and the usual type of chamber. The weight of the high explosive projectile is 100 lb. and with an elevation of 45 degrees a maximum range of 2100 yards is obtained. The arrangement of the mounting will be seen to be similar to that of the 10-in. bomb thrower. The gun is elevated and trained by means of a shoulder piece, and as the gun does not recoil, there is, as in the 10-in. bomb thrower, no load on the shoulder piece. On this mounting a handspike is also provided for the purpose of assisting the training number when the ship is rolling. The weight of the complete equipment is only 35 cwt.

Sighting arrangements in secondary guns.

Reverting to secondary armaments of 6-in. to 4·7-in cal., Messrs. Vickers long since introduced the arrangement of the sight and mounting having the eyepiece of the telescope positioned on or approximately on the axes of the cradle trunnions, thus avoiding the excessive movement of the eyepiece of the telescope, necessary with the former arrangement of sighting gear, situated towards the rear of the gun. Great improvements have been developed in this system.

The improvements were at first introduced on a mounting having the usual type of carriage, arranged in the form of a Y piece, *i.e.* having two side cheeks and a centre pivot, and the ordinary form of conical pedestal.

6-in. and 4·7-in. gun mountings.

With a view to increasing the rapidity of production a modified design of the above type of mounting was introduced. It dispensed entirely with the usual form of carriage and pedestal (which were

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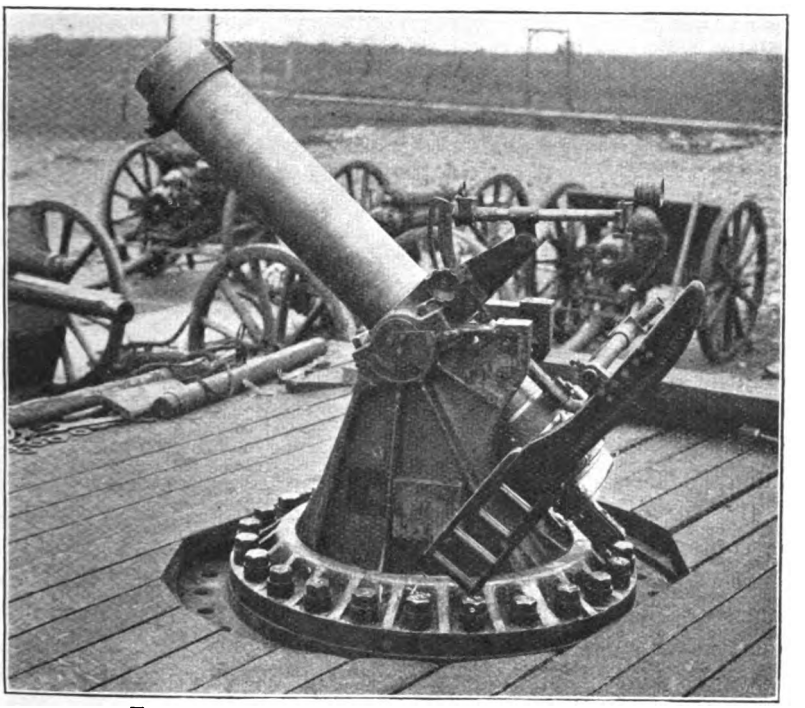

FIG. 13.—7·5-IN. BREECH-LOADING NAVAL HOWITZER.

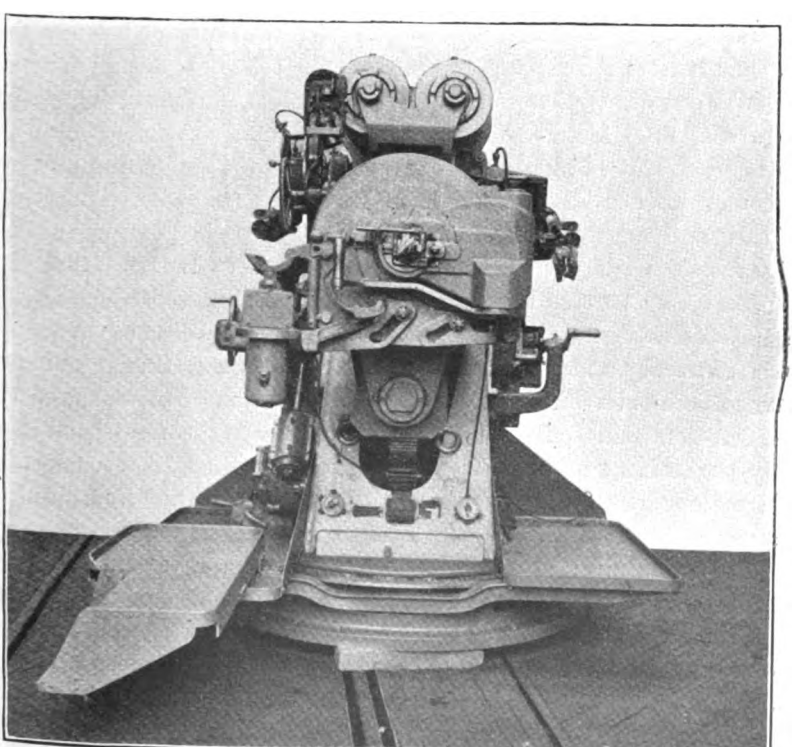

FIG. 14.—SECONDARY GUN ON SLIDING MOUNTING WITH CENTRAL PIVOT.

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usually made up of heavy forgings), and a mounting was produced having a rectangular or conical plate and angle iron carriage mounted on a roller path. This form of mounting (see Fig. 14 on page 397) made it possible to dispense entirely with the side bars, which are essential on mountings fitted with a carriage and pedestal for the purpose of supporting the elevating and training gears, and brought all the operating gears entirely to the front of the carriage, thereby considerably simplifying the design of these parts. The elevating arc which was always attached to the rear of the left or right hand side of the cradle or sidebar was, with this later type of mounting, placed on the underside of the centre line of the cradle, and underneath the cradle trunnions, the whole of the elevating and training gears being more or less contained within the sides of the plate carriage.

By placing the mounting on a large roller path the training of the equipment is made easier, as when the ship is on the roll the centre of gravity of the mounting is always well inside the pitch diameter of the roller path, whereas, on the pedestal type of mountings when the ship is on the roll the centre of gravity of the mass is always outside the pitch diameter of the ball bearing, due to the bearing being small in diameter; consequently it was more difficult to train the mounting with a list on the ship. On this type of mounting there is also introduced a small centre pivot between the top and bottom roller paths in order to take the shear during firing.

Casemate gun mountings.

With regard to the question of transferable gun mountings fitted in a casemate, Messrs. Vickers were the first armament firm to introduce a type of mounting so arranged that the sights would never become "wooded" at any angle of traverse. On all previous types of casemate gun mountings, when the gun approached extreme angles of traverse the sights became "wooded," due to the fact that the telescope came within the main armour of the ship, consequently the sight of either the elevating or training number became "wooded." This great objection rendered it necessary to fit elevating or training gear to both sides of the mounting; if elevating gear was fitted to the left-hand side only and the training gear to the right-hand side only, the training number, when he became "wooded," had to take his instructions for training on the target from the elevating number and *vice versa*.

The same firm also made considerable improvements in the arrangement of casemates of armoured ships, and also in the shields of casemate gun mountings. These mountings, as is well known, are usually disposed in recesses formed by wings of the side armour of the ship, the centre of rotation being so arranged in relation to the

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wings that fairly large angles of training can be obtained. In such arrangements the side armour, with the exception of the wings, follows the general contour of the ship, and, as a consequence, the gun, when firing at or near its extreme angles of training, cannot be elevated or depressed to the extent required at long or short ranges, nor can the object be sighted owing to the fact that the gun and sights are obstructed by the side armour above or below the mounting. These objections were overcome by so constructing the side armour of the ship that its contour above and below the casemate is substantially the same as that of the shield of the mounting. For this purpose the wings of the armour terminate in a portion of semi-circular shape, which is provided with a port of sufficient height to accommodate the gun at its extreme angles of elevation and depression. Behind this port is arranged the shield, which is provided with the usual ports for the gun and the sights. By arranging the shield so that its external diameter is brought inside the main armour the depth of the shield was considerably decreased and the weight of the shield reduced. The necessity of providing the casemate with the top and bottom sill plates usually employed was also dispensed with. By decreasing the depth of the shield a smaller target was presented to the enemy and at the same time the total weight of the training mass was reduced. This form of casemate gun-shield was fitted in H.M. ships Erin and Canada.

Variable power training gear for 6-in. guns.

The question of training the gun rapidly on to the target is, of course, of the very greatest importance. It will be readily appreciated that in a heavy sea, and with a considerable amount of roll on the ship, it is a difficult matter to train at the requisite speed the transferable mountings of guns of 6-in. cal. and upwards by ordinary hand gear. To overcome this difficulty Messrs. Vickers have fitted on Naval mountings a variable power training gear, controlled by means of an electric motor and variable speed gear, which has given highly satisfactory results. The variable speed gear (Williams-Janney type) is really a machine designed to transmit rotary power at variable speeds and in either direction, while the source of power rotates continuously in one direction without any necessary change of speed. The source of power generally used for transferable gun mountings is an electric motor. The variable speed machine consists of two separate mechanisms, one of which functions as an oil pump, the other as an hydraulic engine. The oil pump is driven from the electric motor, and delivers oil to the hydraulic engines at any required pressure and receives it back again, thus keeping up an oil circulation. By interposing "hunting" gear between the training handles on the gun mounting and the control shaft of the variable

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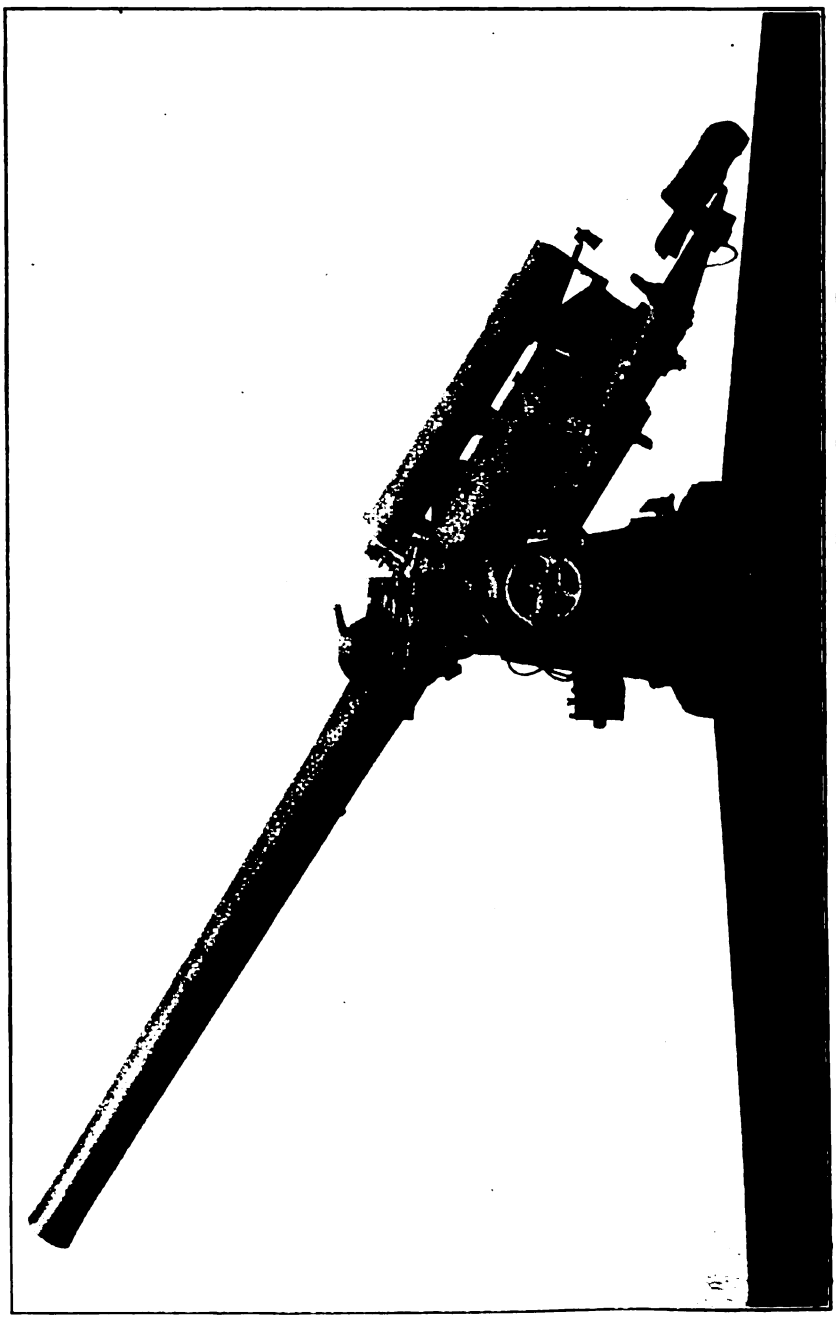

FIG. 15.—4-IN. SEMI-AUTOMATIC GUN AND MOUNTING FOR FLOTILLA LEADERS AND DESTROYERS.

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speed gear, any movement of the gun mounting automatically actuates the controlling member of the variable speed gear machine which regulates the supply of pressure fluid. In this manner the gun and mounting can be kept under perfect control during training.

6-in. gun. with control within side cheeks of the carriage.

The same firm have also introduced a design of gun mounting whereby the elevating and training numbers, the sighting gear, and all the elevating and training operating gear are contained within the side cheeks of the carriage. This form of gun mounting is very simple in design and construction, and possesses the advantage that if it is not desired to fit a shield the carriage is so arranged that it forms a shield in itself. It also possesses the advantage that the elevating and training numbers are seated side by side, and are therefore in a position to communicate with each other as found necessary. All side bars are entirely removed, the elevating arc being attached to the centre line of the cradle and immediately under the cradle trunnions.

4-in. gun mounting for flotilla leaders.

A carriage made by Messrs. Vickers for a 4-in. semi-automatic gun as fitted on flotilla leaders and destroyers is illustrated in Fig. 15 on page 400. The carriage is of the open back type, built up of steel plate and angle iron, and is secured to the base plate of the mounting by means of a large holding down ring, which is made of cast steel. The base plate is provided with a large roller path on which the training mass revolves, and a centre pivot is provided at the bottom of the carriage for the purpose of taking the shear when the gun is fired. The elevating arc is arranged on the centre-line of the cradle immediately underneath the cradle trunnions, and almost the whole of the elevating and training gear is placed inside the conical carriage. The pivot of the sighting gear is coincident with the cradle trunnions. The elevation of the gun is 30 degrees and the depression 10 degrees. The sight is cross-connected, and the general construction of the sight is such that no trouble whatever is experienced in following the target. The position of the telescopes in relation to the cradle trunnions is arranged in such a manner that they are equally convenient for the gun-layers at all angles of elevation. The loading tray is provided on the left hand side of the mounting for the purpose of facilitating the loading of the shot and case into the gun. A light spray shield is provided, and this is carried by suitable supports to the cradle so that it follows all motions of the gun.

Mountings for high-angle guns.

High-angle mountings for anti-aircraft guns have been designed to give elevations up to 80 degrees or 90 degrees and rapid alteration of pointing. Probably the most novel feature of these high angle equipments is the sighting gear. During the war period, as

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was to be expected, considerable developments have been made in sighting arrangements, and very many different designs have been tried. Some of these have been made chiefly from the point of view of cheap and speedy construction; others have been extemporised with a view to adapting quickly existing weapons for new purposes, such as anti-aircraft fire, while others again have been designed with the idea of solving problems of gunfire in the best and most accurate method. Some of the most interesting arrangements produced have been in the class of anti-aircraft equipments.

In the earlier types of this class of sight the construction was simple, the sights being intended more for balloons or slow-moving targets. With the rapidly increasing speed and reliability of the aeroplane, and with the increasing knowledge and data of the behaviour of the fuse and trajectories at high angles of fire, various designs of gradually increasing efficiency have been produced.

High-angle gun sights.

In one of the early types of sighting arrangement made by Messrs. Vickers the tangent elevation for the range was given in a vertical plane passing through the gun trunnions, so that as the gun was elevated the tangent elevation was corrected automatically to the cosine rule (approximately) in a very simple manner, no further setting of the sight being required. This sight also had a simple method of giving the deflection setting to compensate for the motion of the target during the time of flight of the projectile. The estimated speed of the target was set upon a bar, which was adapted to be readily set parallel to the course of the target, with the result that the correct deflection settings were given to the sight both in the horizontal and vertical directions for any angle of sight. The corrections applied by this sight automatically, after practically instantaneous setting, would require about ten to fifteen minutes' calculation to obtain information suitable for approximate setting on the sights of an ordinary pattern, and for this calculation the data required would take about as long to obtain as it takes this corrector sight to be set. Obviously sight setting information obtained at so slow a rate is absolutely useless in the case of quick-moving targets.

Further adjustments were also provided on this sight, both in the vertical and horizontal directions, to allow for the application of any spotting corrections that might be found necessary due to other errors. Afterwards it was found preferable to give the adjustment to the sight for the distance of the target, in terms of the height instead of the range, as the height of the target changes at a much slower rate than does the range.

With the introduction of the Brocq and similar methods of

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determining the angular velocity of the target, and from this the horizontal and vertical deflection, further improvements were made in anti-aircraft sight arrangements.

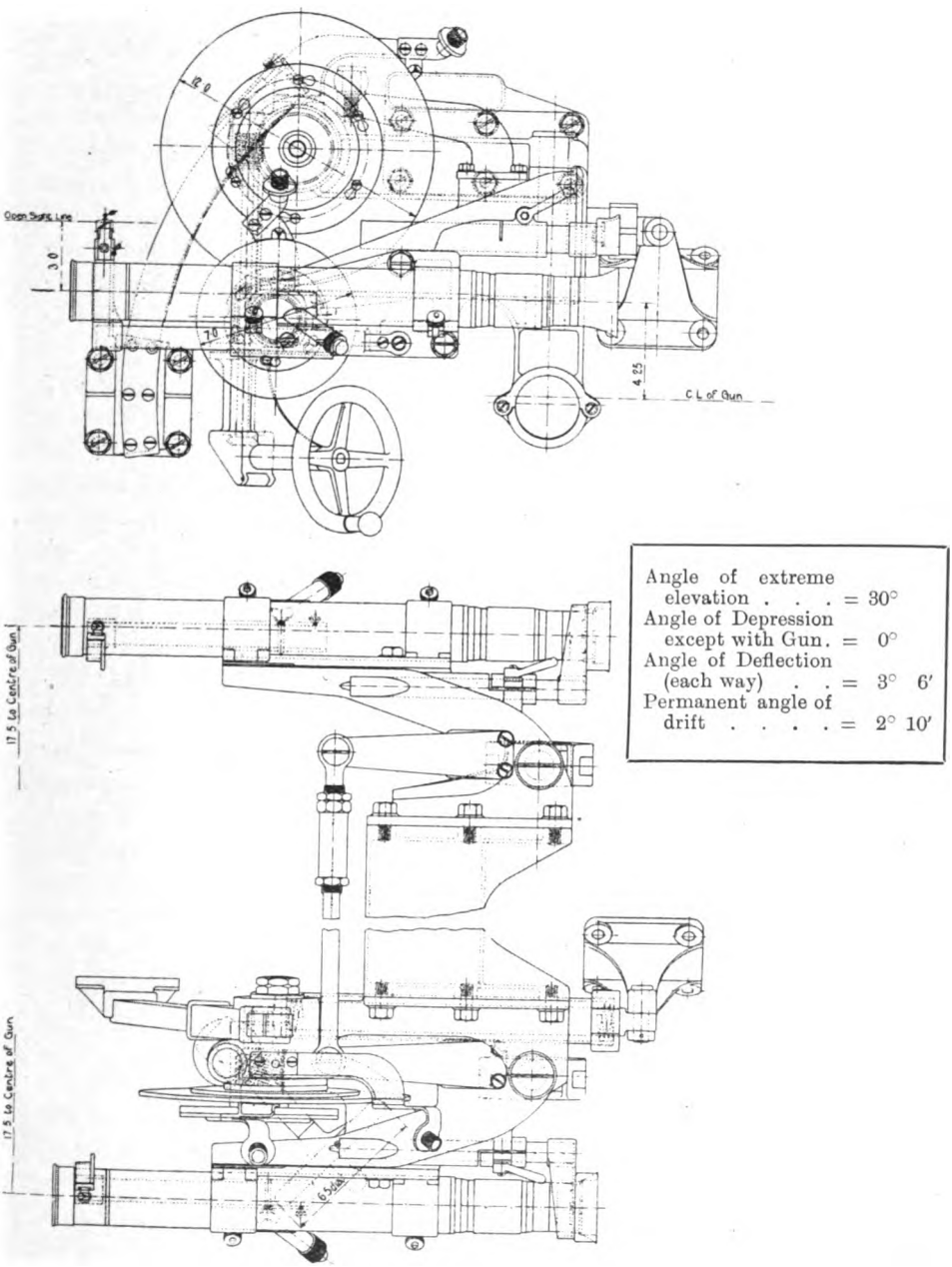
Angle of extreme elevation . . . = 30°
Angle of Depression except with Gun. = 0°
Angle of Deflection (each way) . . = 3° 6′
Permanent angle of drift . . . . = 2° 10′
C L of Gun
17.5 to Centre of Gun
17.5 to Centre of Gun

FIG. 16.—4-IN. GUN SIGHTING GEAR.

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4-in. Naval gun sights.

We are only able to touch very briefly on the various types. Of the other sights for Naval guns designed by Messrs. Vickers, we find twenty-three distinct types have been made. Of these the largest number have probably been made of their 4-in. type (Fig. 16 on page 403), which is very compactly arranged and close to the gun trunnions. This has the usual characteristics of a Naval sight, and is not provided with follow-the-pointer gear or muzzle velocity correctors. Another pattern is that used for the 6-in. secondary armament in which a large elevation of sight is obtained without increasing the headroom necessary for clearance. This is obtained by connecting the elevating cam to the sight frame by means of a connecting rod. Another feature of this sight is that the deflection gear gives the motion to the telescope holders on both sides of the mounting simultaneously, thus avoiding any possibility of lag due to spring or wear in cross-connecting rods.

Universal link breech mechanisms.

Messrs. Beardmore's new "universal link mechanism" (Figs. 17 to 19 on page 405) has been applied to a 4·7 Naval gun with success. The principal feature of this mechanism is extreme simplicity (and therefore ease of manufacture) and the efficiency of the parts actuating the breech screw. These parts consist of a universal link, carrying in spherical bearings two interchangeable unsplit spherical bushes, which form a direct universal connection between the hand lever (near its axis) and the rim of the breech screw. The link also supplies a toggle lock for the breech plug when it is fully screwed home. The universality of the link eliminates the necessity of any intermediate parts, with expensive journals and guides in the carrier, as, for instance, the "sliding block," and the skew and bevel gear used in previous designs. Actual trials with the Beardmore universal link mechanism established the following facts:—(1) By the use of this universal link the remaining details of the breech mechanism are greatly simplified: parts thus specially affected are details of actuating breech screw, details of actuating firing lock, and the carrier. (2) The total machining per mechanism is reduced by 30 per cent., and the effort to be applied at the handle when opening and closing the mechanism is reduced by 50 per cent., as compared with previous designs for the same calibre.

The shot guide consists of a trough-shaped bronze casting fixed to one end of a shaft, and carried by a bracket on the breech face of the gun. The other end of the same shaft is provided with a scroll, which is actuated by a part pivoted in the carrier.

When the mechanism is closed the shot guide is held in such a position that it is clear of the deck at extreme elevation and recoil. When the mechanism is fully open the shot guide projects well into

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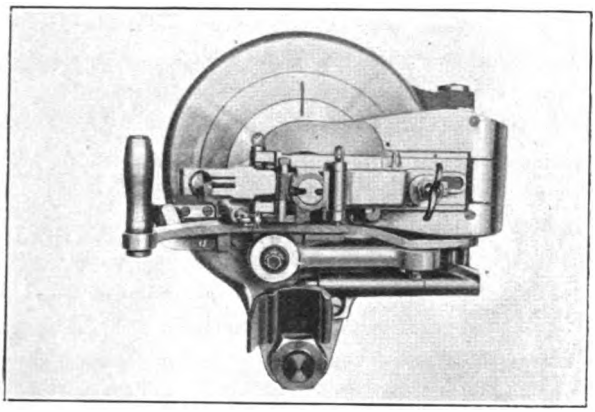

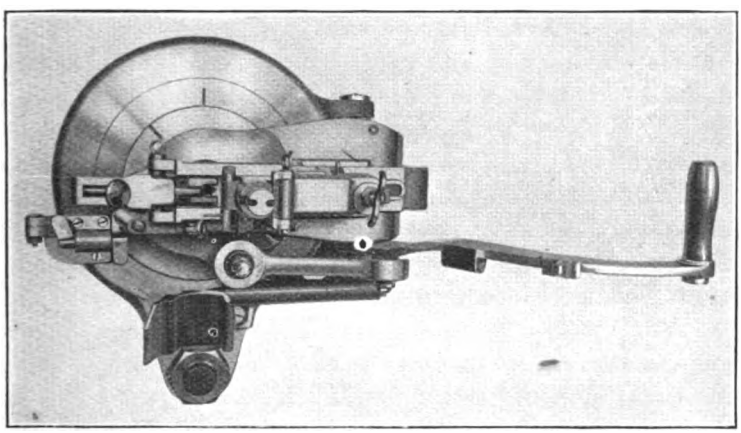

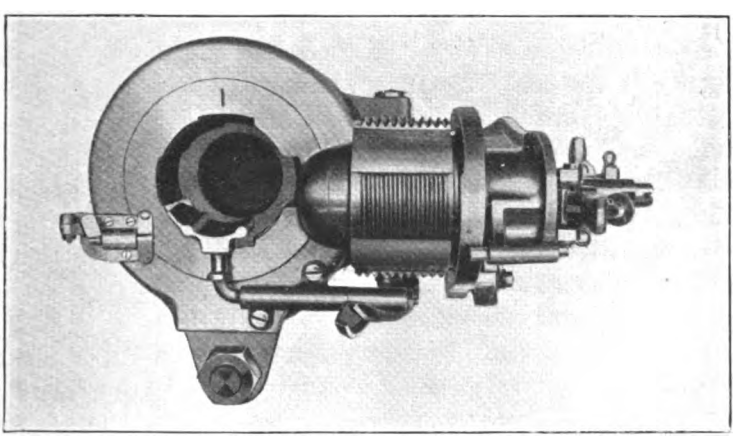

FIGS. 17 TO 19.—UNIVERSAL LINK BREECH MECHANISM.

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the breech opening, giving a better protection to the threads than is generally the case. The guide is held firmly, both when the mechanism is closed and when the shot guide is resting in the breech opening, due to a certain torque, which is purposely given to the shaft in these two positions. This prevents the shot guide from jarring when the gun is recoiling, and also makes it better able, when bearing against the unthreaded portion of the breech opening, to resist a blow from shots dropped on to it.

The firing lock is of the rebounding percussion type, and the striker, after it has been fired, is instantly retracted from the tube by the main spring, which draws it to the rear with a force of 50 lb. The tube extractor is not actuated by the lock frame, as is generally the case, but is given a very powerful primary extracting movement, by a ramp on the breech screw, after which a blow on the sliding knob in the extractor will withdraw the tube retainer and smartly eject the tube. The fact that the extractor is accessible and readily detachable obviates any risk of getting the mechanism locked up solid, due to an exceptionally tight tube which the extractor would be unable to loosen. Working the extractor by the breech screw is a feature which has greatly contributed to the simplicity of machining this lock. Electric firing can be applied without any modification to the box-slide. The firing gear is so designed that the firing number cannot pull the trigger until after the catch-retaining lever has engaged. The mechanism is uncommonly easy to strip and assemble.

11-in. howitzer breech mechanism.

A new Vickers mechanism, besides being applied to several different cal. of guns for land service, has been adopted for the 11-in. Naval howitzer, and 7·5-in. 45-cal. Naval gun. This latter mechanism is illustrated in Fig. 20, on page 407. The main novel feature consists of a specially constructed cam groove or surface cut in the breech opening, or formed in a bracket secured to the breech face. A roller or pin mounted on the breech screw engages with this cam; engagement takes place when the mechanism is swung to within about 7 degrees of the breech face. More than one cam or roller may be used, as circumstances require. The effect produced by this device is, that the breech may be completely closed by simply swinging the mechanism freely towards the breech face when, by the operation of this cam, the breech screw is rotated into complete engagement with the threads of the gun, and at the same time the hand-lever is brought to its locked position.

7·5-in. gun breech mechanism.

In the cases of the 11-in. Naval howitzer and the 7·5-in. gun the hand-lever is placed at the right hand side of the carrier, and lies across the hinge lugs in the vertical plane at an angle of about 45 degrees to the perpendicular. The spindle of the hand-lever is

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mounted longitudinally in the carrier, and has at its inner extremity a crank which engages with the breech screw through the medium of a crosshead, mounted in a rearward extension of the breech screw,

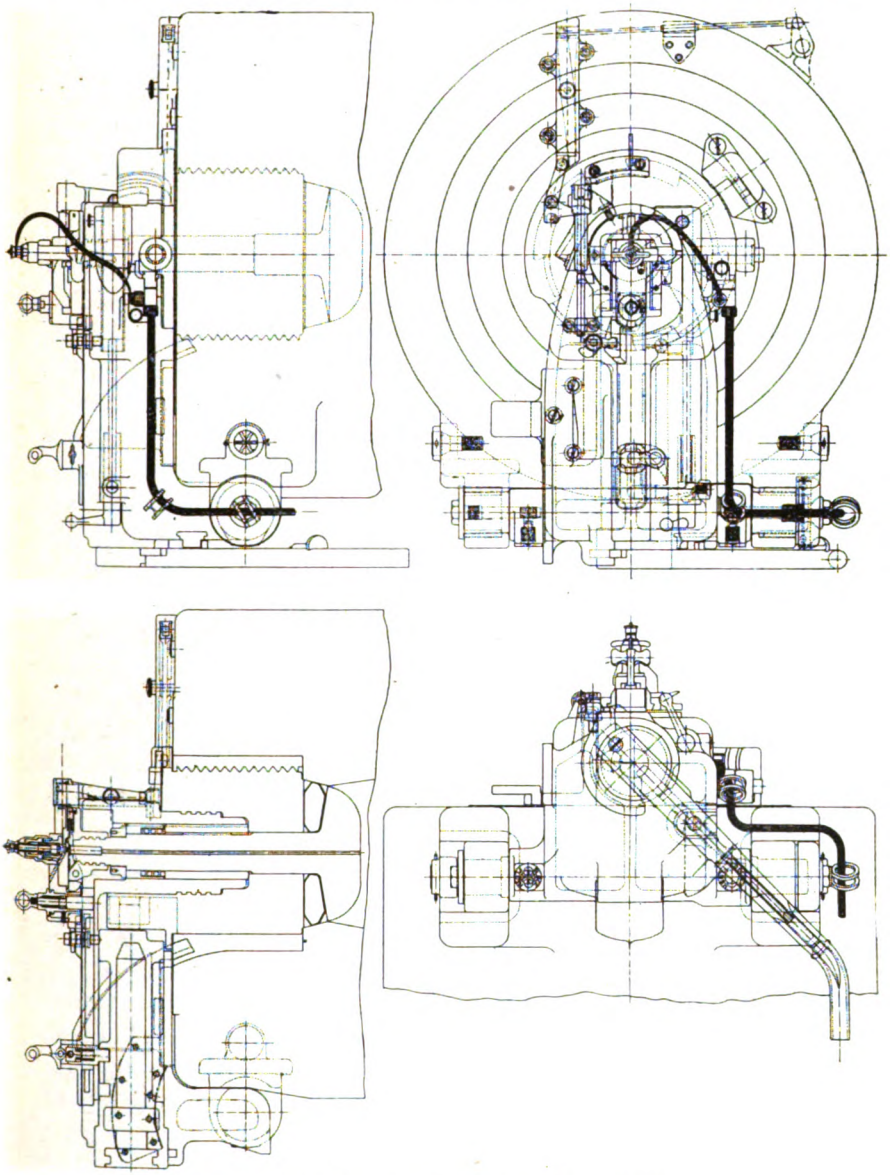

FIG. 20.—7·5-in. GUN BREECH MECHANISM.

and capable of a rotary and sliding motion. This enables the breech screw to be rotated by the hand-lever in opening, and in closing permits the reverse action to take place, viz., the breech screw takes

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charge when its roller engages with the cam, and through the medium of the crank and spindle turns the hand-lever to its locked position. The relation between the operating crank and the sliding crosshead is such that, in the final closing movement of the breech screw and seating of the obturator pad, the maximum power is obtained by its toggle joint action, which latter, at the same time, has the effect of forming a locking point for the mechanism when closed. With a hand-lever of this type, the usual spring catch to retain the breech screw is dispensed with, and a locking or control arc fixed to the breech, and engaging with a slot in the breech screw, or an arm on the handlever—as may be found most suitable—is used, and forms a positive retaining device for the breech screw when swinging to or from the breech face. The hand-lever is provided with a positive catch which prevents it swinging open during the run-out of the gun.

The principal advantages of this type of mechanism are :—(1) The ease and speed with which even heavy mechanisms can be operated by hand. The mere act of swinging in rotating the breech screw and bringing the hand lever to its home position. (2) The elimination of "jar" when swinging the mechanism to the breech face. The value of this feature in preserving the more delicate parts of the mechanism, such as the firing gear, cannot be over estimated. (3) The convenient and safe position of the hand lever for the operator, who does not require to stretch across the breech face when opening or closing the mechanism. (4) The elimination of the spring-retaining catch for the breech screw by the introduction of the positive locking or control arc. (5) The small number and simplicity of the component parts.

10-in. bomb thrower's breech mechanism.

The mechanism for the 10-in. and 7·5-in. bomb throwers, are of the horizontal sliding block type, consisting of two main parts, the breech block and the actuating lever. The latter is pivoted at its centre to the breech block in alignment with the axis of the gun, and contains the firing and cocking gear. The operating handle is on the upper end of the lever and the actuating pin on the lower end, and it engages with a groove cut in the gun. To operate the mechanism, a catch in the handle of the lever is pressed, thereby unlocking the mechanism and retracting the striker. The rotation of the lever withdraws the block to one side, and at the same time cocks the firing gear and ejects the cartridge case.

"Gun director" systems.

Referring again to the improvements in the sighting gear, Messrs. Vickers' "follow-the-pointer" system of sighting has been expanded into the "gun director" system, in which one sight is used for a group of guns. Briefly, the advantages of director firing are :—(1) The layer is aloft, clear of interference, and likely to obtain the best

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possible view. (2) All guns are fired simultaneously at the same period of the roll, and as they all have their exact elevation relative to the range, the personal errors of a number of gun-layers are reduced to that of one man, viz., the director layer, whose error is a constant. (3) The shots falling simultaneously facilitate spotting, and afford the best data that a proportion are hitting. (4) By utilising the roll of the ship to give the guns full elevation a correspondingly long range is obtained. (5) Director firing can be used when the state of the weather and the visibility preclude any other kind of firing. A highly efficient form of director firing gear has been designed and manufactured by the firm and fitted approximately to 300 ships of different types of the Navy, viz., battleships, battle-cruisers, light cruisers, flotilla leaders and destroyers.

18-in. armour-piercing shell.

In Fig. 21 on page 410 is reproduced a photograph of Hadfield's armour-piercing shell for the 18-in. Naval gun. This shell weighs about 1½ tons, and its capabilities, worked out under the De Marre formula, are as follows:—At point blank range no less than 41 inches of hard-faced armour is perforated. This is equivalent to a wall of unhardened steel of about 54 inches. At 10 miles and 20 miles respectively this projectile will perforate 22 inches and 12½ inches of hard-faced armour of the latest and best type. Finally, at the extreme range of 30 miles, this shell will still perforate armour of ordinary steel plate having a thickness of close upon a foot. This projectile, in actual trials, has perforated a hard-faced plate of a thickness nearly equal to its calibre at a velocity equivalent to a range of about 14 miles.

The feat of hardening an armour-piercing shell of these dimensions will be readily understood, for suddenly a volume of something like 10,000 cubic inches of steel has, by quenching, to be converted from material of a Brinell ball hardness of only about 200 to that of between 600 and 700. To deal with the strains set up by the sudden change from what is almost material of plastic nature to that of extreme rigidity is indeed a difficult problem. This can be imagined when it is stated that material of this high rigidity readily scratches glass. In addition, it must be borne in mind that the rupture strains which are set up by the sudden cooling mentioned may continue for even months afterwards. In this respect our readers who are interested in this important question are referred to two interesting papers:—(1) "Spontaneous Generation of Heat in Recently Hardened Steel," by Dr. Charles F. Brush and Sir Robert A. Hadfield. (2) "Further Experiments on Spontaneous Generation of Heat in Recently Hardened Steel," by Dr. Charles F. Brush, Sir Robert A. Hadfield, and Mr. S. A. Main.

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FIG. 21.—ARMOUR-PIERCING SHELLS FOR 18-IN. NAVAL GUNS.

FIG. 22. — 12-IN. ARMOUR-PIERCING SHELL AFTER PERFORATING, UNBROKEN, A 12-IN. HARD-FACED ARMOUR PLATE INCLINED AT 15 DEGREES.

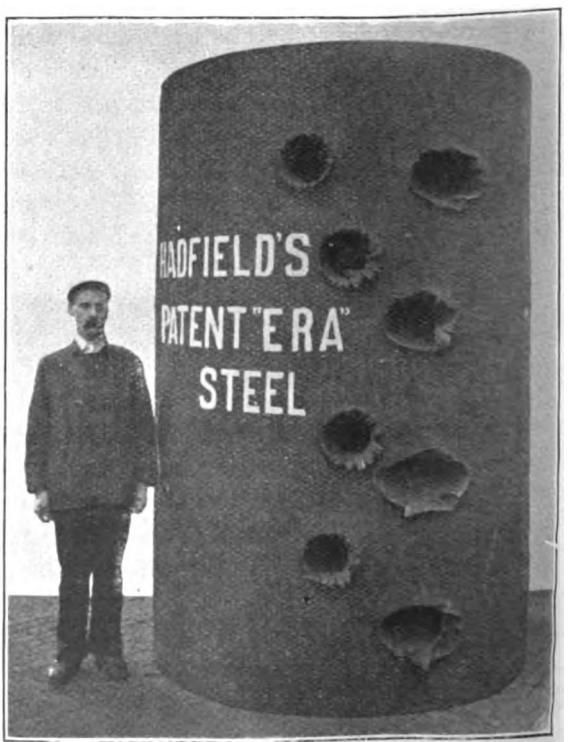

FIG. 23.—AMMUNITION TUBE, 7 IN. IN THICKNESS, OF HADFIELD'S PATENT "ERA" STEEL.

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In view of recent discussions on the subject of the oblique impact of projectiles, the photographs reproduced on the opposite page will be of interest. Fig. 22 shows a 12-in. armour-piercing shell which perforated, unbroken, a 12-in. hard-faced armour plate inclined at 15 degrees.

Fig. 23 is also interesting, as it shows one of the 7-in. thick "Era" steel ammunition tubes constructed by Messrs. Hadfield for H.M. ships and monitors, amongst others the Abercrombie, Havelock, Roberts, Erebus, and Terror. The steel of which these are made is capable of resisting severe gunfire without cracking or splitting. Table II. shows the degree of "punishment" which such "Era" cast steel stood without cracking or splitting:

TABLE II.—DETAILS OF ATTACK ON "ERA" STEEL 7-IN. THICK, ILLUSTRATED BY FIG. 23.

Round No.	Type of Projectile.	Calibre.	S.V. f.s.	Energy. Ft. tons.
1	S.A.P. Shell	6 in.	1,779	2,225
2	Common Shell	,,	1,725	2,070
3	,, ,, ...	7·5 in.	1,888	4,950
4	,, ,, ...	9·2 in.	2,040	11,000
5	S.A.P. Shell	,,	2,031	10,900
6	A.P. Shot	6 in.	1,452	1,465
7	,, ,, ...	,,	1,437	1,435
8	,, ,, ...	,,	1,453	1,465
9	,, ,, ...	,,	1,549	1,670
10	,, ,, ...	,,	1,652	1,895
11	,, ,, ...	,,	1,652	1,895
12	,, ,, ...	,,	1,549	1,670
13	,, ,, ...	,,	1,453	1,465
14	,, ,, ...	,,	1,437	1,435
15	,, ,, ...	,,	1,399	1,360
16	,, ,, ...	,,	1,394	1,350
17	,, ,, ...	,,	1,298	1,170
		Total energy . .		49,420

"Era" cast steel armour.

Fig. 24 on the next page is an illustration of an example of Hadfield "Era" cast steel. It represents the conning tower roof and the spotting and signalling tower made in two pieces, the total weight being 17½ tons.

Paravanes for protecting ships from mines.

At the beginning of this chapter we mentioned the great ingenuity exercised by the enemy in the laying of mine-fields, and there is no doubt the most effective appliance for protecting vessels from mines laid by the enemy is the paravane. Fig. 25, on page 412, shows the M type (the Otter). These machines, which are designed for the use of merchant ships, are towed by means of steel wire-rope extending on each side of a vessel from the stem, and arranged to run at a predetermined depth at about 50 ft. from the ship's side and about 180 ft.

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from the stem, thus affording protection over the whole length of the ship. The depth is regulated by means of a hydrostatic valve which operates on a rudder in the tail of the Otter, thereby automatically controlling its depth. The body of the Otter is manufactured of ship's plate, as is also the plane. The plane is set at an angle sufficient to

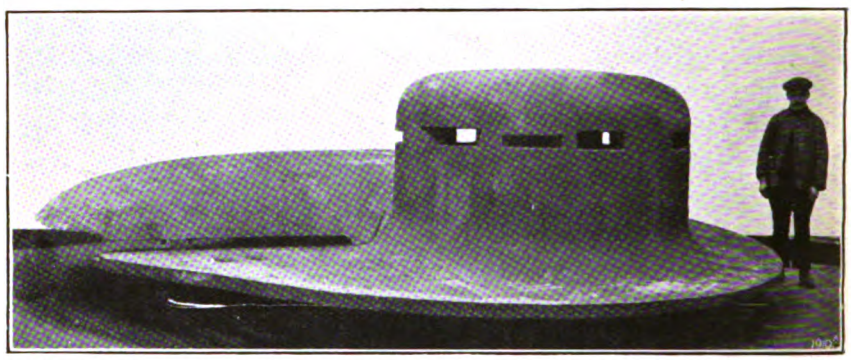

FIG. 24.—CONNING TOWER ROOF AND SPOTTING AND SIGNALLING TOWER, MADE IN TWO PIECES OF HADFIELD'S PATENT "ERA" CAST STEEL. TOTAL WEIGHT 17½ TONS.

exert a continuous strain upon the towing rope, which is kept perfectly taut. On the upper side of the plane is fitted a wooden float, and on the lower side a weight. The towing rope is secured by means of a sleeve and shackle to a cutting device which is fixed on the towing frame of the Otter. Briefly, the action of the Otter is to pick up the

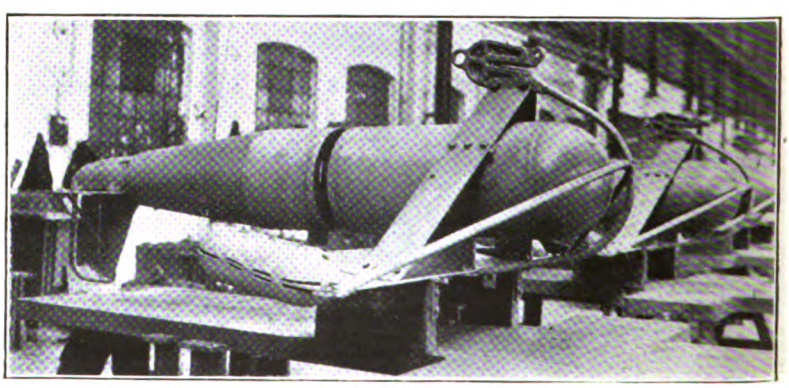

FIG. 25.—THE "OTTER" TYPE OF PARAVANE.

mine moorings, which are caught against the towing rope by which it is forced into the jaws of the cutting apparatus. This severs the mooring ropes, thus releasing the mine, which, being buoyant, immediately rises to the surface, and is thereafter destroyed.

The use of Otters makes a vessel actually mine-proof. The

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question is often asked as to the result of a vessel encountering a mine at a point at which the towing ropes issue from the stem of the ship. In practice it has been found that the mine is always thrown to one side or the other, and effectively dealt with by the device, possibly owing to the fact that in all vessels in motion an invisible cushion of water is being pushed in front of the stem which tends to throw any object in its direct path either to one side or the other. The reduction in speed due to the fitting of the apparatus is very slight, and whilst it naturally varies with the size of the ship it may be assumed generally to range between a quarter and a half of a

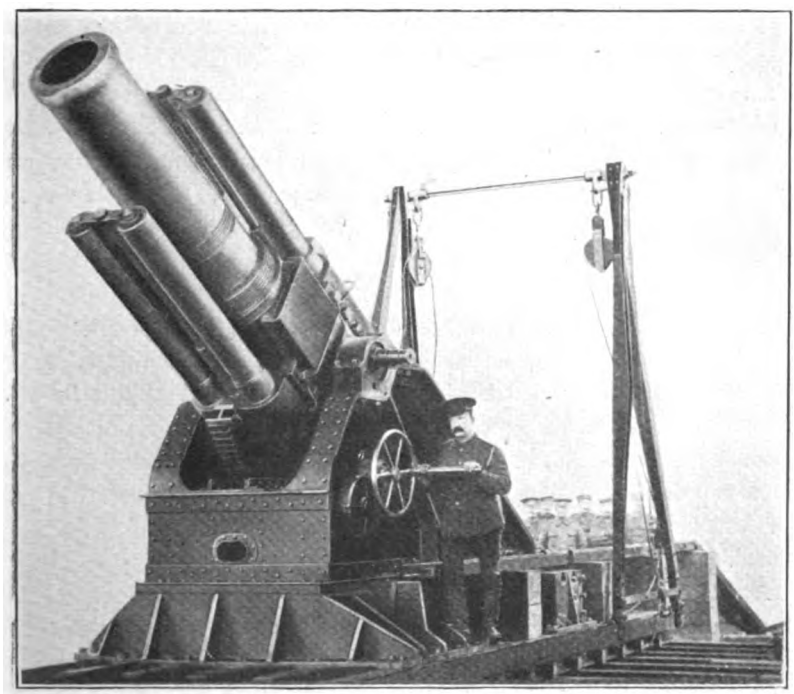

FIG. 26.—15-IN. HOWITZER ON LAND MOUNTING.

nautical mile per hour. In the event of a ship stopping, the Otter, being buoyant, gradually rises to the surface, and when the ship gets under way again the Otter resumes its effective position. This device has been the means of saving many hundreds of thousands of tons of shipping and many thousands of valuable lives, and its action is so definite that the enemy discovered no means of diminishing its efficiency.

There are many types of paravanes, and those designed to run at a higher speed than the Otter, above described, are fitted with an oscillator in the form of a mercury column, which acts directly on

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the rudder in place of the hydrostatic valve, already described. Paravanes of the explosive type, charged with T.N.T., and designed for submarine destruction, have also been used with excellent results by electric detonation in three ways, by direct contact, by indirect contact in conjunction with a dynamometer switch, or independently fired from the bridge of a vessel.

15-in. Naval howitzer on land mounting.

In addition to the guns and mountings provided by the Admiralty for ships, some land equipments were undertaken and manned by marines. One of the earliest of these was the Coventry Ordnance Works' 15-in. howitzer, which was in action in the early part of 1915. The total weight of this equipment, including the foundation, is 54 tons; it is arranged to be easily separable into loads of between 5 tons and 7 tons. The howitzer fires a projectile of 1400 lb. with a muzzle velocity of 1117 f.s., giving a maximum range of about 11,000 yards. As this weapon embodies many new features it may be considered to have been a very creditable performance to turn out the first one in the short space of four months. It is shown in Fig. 26 on page 413.

12-in. Naval gun on siege mounting.

The Coventry firm also designed and manufactured for the Admiralty siege mountings to take 12-in. Naval guns, which were erected on land for the defence of Dunkirk. This mounting is shown in Fig. 27 on page 415, and is provided with pneumatic recoil arrangements and fitted with the firm's adaptation of the Compayne hydraulic transmission gear for elevating. The transmission gear comprised a 20-H.P. petrol engine driving a variable throw pump which supplied oil under pressure to the elevating cylinder. These guns did very effective work in the bombardment of the forts near Ostend.

12-in. Naval gun on railway truck mounting.

Another departure of the Admiralty in the direction of equipments for use on land was the mounting of the 12-in. Naval gun on a railway truck mounting. This mounting, generally, consisted of two main longitudinal girders suitably connected to each other by transoms. The girders are supported at the front end on a girder frame connecting two eight-wheeled bogies, and at the rear end on a girder frame connecting two six-wheeled bogies. The rear end of the main girders is pivoted on the centre of the rear bogie girder frame, and the front end is movable to an angle of approximately one degree each side of the centre line to allow for final adjustment of sighting before firing. The firing position of the gun is obtained approximately by moving the mounting along the curved railway, thus enabling the piece to be approximately trained on the enemy object and then finally laid by means of the traversing gear referred to. Large angles of elevation were possible from 10 degrees up to 35½ degrees. The

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FIG. 27.—12-IN. NAVAL GUN MOUNTED FOR LAND SERVICE.

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ammunition wagon was attached to the rear of the gun truck, from which the supply of shell and powder were transferred.

National indebtedness to large armament firms.

We cannot end this chapter without referring to the indebtedness of the Nation to the large armament firms—an indebtedness which has never been acknowledged nor fully realised. The declaration of war in 1914 found the principal armament firms manufacturing guns under ordinary peace conditions. The armaments being manufactured were almost entirely on behalf of the Naval Service, and were intended for battleships and other vessels provided for in the ordinary Estimates. There were, however, in addition to these certain vessels with their armaments in course of completion for various foreign countries, and these proved to be a very great asset to the country, as they were taken over, finished in a short space of time, and commissioned for service with the Grand Fleet and for other duties. The total amount of work done would surprise most people, many of whom have not perhaps fully appreciated the stupendous efforts put forward by the armament firms on behalf of the country, nor realised the benefit accruing to the Empire by having a large amount of foreign construction in this country. At the same time the usual supply of projectiles under peace conditions for the Admiralty had to be enormously augmented, the output being increased from hundreds to hundreds of thousands. So frequent were the calls that in the early days, when the difficulties were greatest, there were times when upwards of seventy different types of shell ranging from 1½-pdr. pom-pom to 15-in. were being made simultaneously.

As time went on, in addition to the usual supplies of projectiles referred to above, new types and experimental work were constantly required from these firms. These requests meant constant re-adjustment of machinery and special supervision, which cannot be reflected, even in a bare statement of the number of shells produced. The long and proved experience of the armament firms in the manufacture of war material of all kinds was wisely turned to the best advantage by the Government. Sub-contractors were engaged to assist in the production of the various kinds of war material, and as none of them had previously undertaken work of this kind the necessary guidance had to be given them by the existing firms. National factories for shell and armaments were laid down, and the armament firms undertook the design, erection, and management, in a greater or less degree, of these establishments, their large experience gained by years of study and great expenditure being freely given for the benefit of the Allies.

ALEX. RICHARDSON.

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BRITISH NAVAL ORDNANCE.

These Tables are reproduced with little alteration. The 18-in., 15-in., 14-in. and other guns are mounted, but many details are withheld from publication. Details of some of the new guns will be found in the Armstrong, Vickers, and Coventry Ordnance Tables which follow. New types of guns are indicated on pages 381, 394, 396 and 401.

Ordnance.									Charge. (full).	Charge (cordite).		Projectile.					Ballistics (with full charges).					
Nature.				Chamber.		Rifling.													Perforation of wrought iron.			
Calibre or Pr.	Weight.	Mark and Service.	Total length in inches.	Length of Bore, including Chamber.	Diameter.	Length to base of projectile.	Twist one turn in: Least at breech.	Twist one turn in: Greatest at muzzle.	System.*	Weight.	Weight.	Size.	Diameter.	Weight.	Bursting Charge of Common Shell.	Value of $\frac{d^3}{w}$.	Value of $\frac{w}{d^2}$.	Muzzle velocity.	Total muzzle energy.	Muzzle energy per ton of gun.	At muzzle.	At 1000 yards range.	At 2000 yards range.	At 3000 yards range.
QUICK-FIRING GUNS				cals.	ins.	ins.	cals.	cals.		lbs.	lbs. ozs.		ins.	lbs.	lbs.			f. s.	ft. tons.	ft. tons.	ins.	ins.	ins.	ins.
6·0 in	7 tons	I. & III. / II. (Wire)	249·25	40	..	..	60	30	P.	..	13 4	30	6·0	100·0	..	0·360	0·463	2200	3356	479	15·9	12·7	10·2	8·2
6·0 in.	5 „	I. to VI.	169·1	26·2	..	..	..	..										1913	2537	362	13·0	10·3	8·2	6·4
			166·6	26·6	..	..	..	..																
4·7 in.	41 cwt. / 42 „	I. II. III. & IV. Wire	194·1	40	..	..	100 / 0	34·4 / 30	E.O.C.	..	5 7	20	4·72	45·0	..	0·495	0·428	2188	1494	711	12·4	9·2	6·6	5·0
4 in.	26 cwt.	I. II. III. Wire converted guns	165·25 / 120	40 / 28	..	..	..	30	M.Pl.	..	3 9	15	..	25·0	..	0·640	0·390	2300	917	705	10·5	6·9	4·9	3·3
																		2177	821	569	9·5	6·5	4·6	3·0
12-pr.	12 cwt.	I.	123·6	40	..	..	120 / 0	28 / 30	E.O.C. / M.Pl.	..	1 15	10	3·0	12·5	..	0·072	0·463	2210	423	677	8·1	5·3	3·5	2·4
12-pr.	8 cwt.	I.	87·6	28	..	..	60 / 0	28 / 30	E.O.C. / M.Pl.	..	13¾	10	3·0	12·5	..	0·072	0·463	1607	223·8	544	4·9	3·2	2·4	..
Hotchkiss . 6-pr...	8 cwt.	I. & II.	97·63	40·0	..	..	180	29·9	M.Pl.	..	b7¾	5	2·24	6·0	..	0·836	0·534	1818	137·5	344·8	4·8	2·8	..	..
Nordenfelt . 6-pr...	6 cwt.	I. II. & III.	104·4	42·3	..	..																		
Hotchkiss . 3-pr ..	5 cwt.	I. & II.	80·63	40	..	..	25	25	M.Pl.	..	b6⅜	5	1·85	3·3	..	1·037	0·521	1873	80·3	321·2	4·1	2·1	..	..
Nordenfelt . 3-pr...	4 cwt.	I. L.	91·5	45·4									..	..	..	..	..	1920	84·3	337·2	4·3	2·2	..	..
MACHINE GUNS.																								
Maxim, 1 bar 0·45 in.	63 lbs.	I.	·45·0	..	..	..	10	27	Enfi'ld	grains. 31 Cordite	..	..	grs. 0·450	480	..	2·952	0·751	..	..	..	Same as M.H. Rifle.			
Maxim, ·303			42·38				10	25·6	Metf'd				0·303	215	..	..	..	..	..	..	Same as Lee-Metford.			

BRITISH NAVAL ORDNANCE.—*continued.*

(See note on previous page.)

Ordnance.										Charge (cordite).		Projectile.						Ballistics (with full charges).						
Nature.					Chamber.		Rifling.													Perforation of wrought iron.				
Calibre or Pr.	Weight.	Mark and Service.	Total length in inches.	Length of Bore, including Chamber.	Diameter (at largest).	Length to base of projectile.	Twist one turn in. Least at breech.	Twist one turn in. Greatest at muzzle.	System.†	Weight.	Size.	Diameter.	Weight.	Bursting Charge of Common Shell.	Value of $\frac{d^2}{w}$.	Value of $\frac{w}{d^3}$.	Muzzle velocity.	Total muzzle energy.	At muzzle.	At 1000 yards range.	At 2000 yards range.	At 3000 yards.	Perforation Krupp steel, 3·00 yards. Uncapped Shot.
B.L. GUNS.				cals.	ins.	ins.	cals.	cals.		lbs. oz.		ins.	lbs.	lbs. oz.			f. s.	ft. tons.	ins.	ins.	ins.	ins.	ins.
16·25-in.	110½ tons.	III.	524·0	30·0	21·125	84·5		30	Modified Pl. Section, the last in the new guns.	960‡ S.B.C.	..	16·25	1800	‡‡193 **179¼	0·147	0·420	2087	54,390	38·0	34·6	31·7	29·4	13
13·5-in.	69 & 67 tons.	I. II. III.& IV.	433·0	30·0	18·0	66·5		30		187 8	..	13·5	1250	**85	0·146	0·508	2016	35,230	33·0	30·2	27·6	25·2	11
12-in.	46 tons.	VIII. Wire	445·5	35·43	16·0	70·0		30		167 8	50	12·0	850	80–1 $\frac{9}{11}$	0·169	0·492	2367	33,020	37·0	32·7	29·4	26·6	11½
12-in.	50 tons.	IX. Wire	496·5	40·0	17·5	87·2		..		201 8 9 8	50 33/4	12·0	850	„	..	..	2481 §2580	36,290 39,280	39·7 42·0	35·4 38·0	31·6 34·6	28·7 32·0	12½ 14
12-in.	58 tons.	X. Wire*	558·0	45·0	..	..		..		325 0 M.D.	..	12·0	850	..	..	..	2900	47,697	51·0	46·2	42·0	38·4	17
10-in.	31 tons.	Triumph & Swiftsure	483·0	45·0	14·0	64·5		..		..	..	10·0	500	..	..	..	§2800	§27,205	39·5	34·6	30·2	27·0	11¾
10-in.	29 tons.	II. III. III.A & IV.	342·4	32·0	14·0	54·0		30		76 0	30	10·0	500	37¾	0·200	0·500	2040	14,430	24·8	21·8	19·3	17·0	7½
9·2-in.	21 & 22 tons.	I. & II.	255·8	25·56	11·0	44·0		35	newer patterns.	42 0	30	9·2	380	18	0·223	0·488	1781	8,356	18·3	15·9	14·4	12·4	5½
9·2-in.	24 & 22 tons.	III. V. VI. VI.A&C & VII.	310·0	31·5	12·0	43·0		30		53 8	30	9·2	380	‡‡33 **30 6/16	0·223	0·488	2065	10,910	22·9	19·8	17·2	15·5	6¾
9·2-in.	25 tons.	Wire VIII.	384·0	40·08	10·5	53·15		..		63 0	40	9·2	380	..	0·223	0·488	2347	14,520	27·6	23·9	20·7	18·0	7¾

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9·2-in.	28 tons.	Wire X.	442·35	46·6	13·0	71·215	Various in the P. Elswick, Hook, or	..		103	0	44	9·2	380	..	0·223	0·488	{2640 ◊2800	18,400 20,685	33·3 36·0	28·9 31·2	25·0 27·4	22·0 24·0	9½ 10½
7·5-in.	16 tons.	Triumph & Swiftsure	386·7	50·0	..	46		..		..		..	..	200	..	0·281	0·474	§2800	10,883	29·0	24·9	21·4	17·8	7¾
7·5-in.	14 tons.	..	337·5	45	11·1	55		30		47 0 30 2 8 2½			7·5	200	18½	0·281	0·474	2600	9,340	26·0	22·3	18·8	15·7	6¾
6-in.	5 tons.	III.	170·7	25·53	8·0	26·75		35					6·0											
6-in.	5 tons.	IV. VI.	173·5	26·0	8·0	26·75		35 30		14	12	20	6·0	100	7 15/16 **9 13/16	0·360	0·463	1960	2,665	13·4	10·7	8·9	7·0	3
6-in.	7·4 tons.	VII. VIII.	269·5	45	8·5	32·7		30		20	0	20	6·0	100	9	0·360	0·463	{2493 ◊2750	4,308 5,250	19·6 22·3	15·3 18·0	11·9 14·6	9·8 11·6	4¼ 5
4-in.	23 cwt. 26 cwt.	II.II*.III.III*. IV.V.& VI.	120·0	27·0	5·3	18·5	120	30		3	1	5	4·0	25	1 1/16 3 5/16	0·640	0·391	1900	625	7·7	5·4	4·0	3·0	..

* Some details of the 12-in. Mark X. uncertain.

† P. means Polygroove; Pl., Plain ‡ Cordite has not been introduced for this gun; ◊ Estimated with M.D. cordite; ** Cast steel; ‡‡ Forged steel.

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FRENCH NAVAL ORDNANCE.

Date and Pattern of Gun.	Model 1913.	Model 1906.	Model 1902.	Model 1893–96.				Model 1893.				
Desig. by Calibre, in cms.	34	30·5	30·5	30·5	27·44	24·0	19·4	34·0	30·5	27·44	24·0	19·4
Calibre, in inches	13·4	12·01	12·01	12·01	10·8	9·45	7·64	13·39	12·0	10·8	9·45	7·64
Total length, in feet	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in ins.	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in cals.	45	50	45	40	40	45	45	35	40	40	40	40
Total weight, in tons	66	45	..	44·4	34·5	23·6	12·5	52·9	45·9	34·9	22·4	10·6
Weight of Firing Charge, Armour-piercing Projectile lb.	..	..	..	246	188·5	145½	74	243·0	198·4	114·6	110·2	44·1
Weight — Armour-piercing Projectile lb.	1190	960	750	750	562	375	190	925·9	643·8	476·2	317·5	165·3
Weight — Common Shell „	..	..	..	750	562	375	190	925·9	643·8	476·2	317·5	165·3
Muzzle Velocity, in f.-s., A.P. Projectile	..	2871	2870	2650	2650	2870	2870	2400	2625	2625	2625	2625
Muzzle Energy — Total, in f.-t.	65340	54343	42890	36782	27186	21445	10890	36850	30750	22750	15170	7898
Muzzle Energy — Per in. circ., f.-t.	..	..	..	..	..	..	..	..	815·8	670·7	511·1	329·1
Perforation at Muzzle,† wrought iron, inches	..	..	46·0	42·7	38·8	37·0	29·0	36·8	37·3	33·7	29·4	23·4
Perforation Krupp Steel, 3000 yds.	11·8 (9000 mètres)	..	15½	13½	11½	10½	6¾	11½	11	9	7½	5½

Corrected to April, 1919.

† By Tresidder's formula.

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UNITED STATES NAVAL ORDNANCE.

GUN.	MARK.	Length in Calibres.	Total Length	Capacity of Chamber in Cubic Inches.	Travel of Projectile in Inches.	Weight of Gun.	Weight of Projectile.	Weight of Charge.	Muzzle Velocity.	Muzzle Energy.	Penetration at Muzzle, Krupp Armour, using Capped Projectile.	At 3000 Yards.		At 6000 Yards.		At 9000 Yards.	
												Remaining Velocity.	Penetration.	Remaining Velocity.	Penetration.	Remaining Velocity.	Penetration.
			inch.			tons.	lb.	lb.	ft.-seconds.	ft.-tons.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.
3-in. R.F.G.	II., III.	50	154	219	128·3	0·9	13	3·85	2700	658	3·3	1230	1·2	848	0·8	..	..
3-in. S.A.	V., VI.†	50	159	219	128·3	1·0	13	3·85	2700	658	3·3	1230	1·2	848	0·8	..	..
4-in. R.F.G.	III., IV., V., VI.	40	164	331	134·5	1·5	33	4·85	2000	915	3·4	1156	1·7	897	1·2	..	..
4-in. R.F.G.	VII.	50	205	652	168·3	2·6	33	9·0	2500	1,430	4·6	1432	2·2	979	1·4	853	1·2
4-in. R.F.G.	VIII.‡	50	205	652	168·3	2·9	33	12·3	2800	1,794	5·3	1627	2·6	1033	1·5	878	1·2
5-in. R.F.G.	II., III., IV.	40	206	656	165·8	3·1	50	10·0	2300	1,852	5·3	1286	2·6	934	1·7	829	1·4
5-in. B.L.R.	V., VI.	50	256	1,200	215·6	4·6	60	19·2	2700	3,032	6·2	1692	3·5	1102	2·0	928	1·6
5-in. B.L.R.	VI.	50	256	1,200	215·6	4·6	50[1]	20·5	3000	3,122	6·4	1732	3·2	1057	1·7	877	1·4
5-in. R.F.G.	VII.§	51	261	1,135	215·6	5·0	50	23·8	3150	3,439	6·8	1835	3·4	1091	1·8	895	1·4
6-in. R.F.G.	II., III.	30	196	1,287	150·0	4·8	105	18·8	1950	2,768	5·3	1305	3·2	1009	2·3	909	2·0
6-in. R.F.G.	IV., VII.	40	256	1,320	205·8	6·0	105	18·8	2150	3,365	6·0	1440	3·6	1058	2·4	934	2·1
6-in. R.F.G.	IX.	45	270	1,320	221·7	7·0	105	18·8	2250	3,685	6·3	1511	3·8	1086	2·5	948	2·1
6-in. B.L.R.	VI.	50	300	2,101	247·5	8·3	105	30·0	2600	4,920	8·6	1770	4·7	1207	2·9	996	2·2
6-in. B.L.R.	VIII.	50	300	2,101	247·5	8·6	105	37·0	2800	5,707	11·3	1923	5·2	1297	3·2	1026	2·3
7-in. B.L.R.	II.	45	323	3,643	259·8	12·7	165	58·0	2700	8,338	9·6	1948	6·4	1382	4·2	1083	3·0
8-in. B.L.R.	III., IV.	35	305	3,170	245·8	13·1	260	43·8	2100	7,948	8·6	1576	6·0	1206	4·2	1040	3·6
8-in. B.L.R.	V. and VI.	45	369	5,243	299·1	18·7	260	98·5	2750	13,360	12·0	2106	8·6	1589	6·1	1227	4·4
10-in. B.L.R.	I., II.	30	329	6,779	251·1	25·1	510	90·0	2000	14,141	10·7	1590	8·0	1274	6·1	1103	5·0
10-in. B.L.R.	III.	40	413	10,222	327·0	34·6	510	207·5	2700	25,772	19·4	2184	11·9	1747	9·0	1406	6·9
12-in. B.L.R.	I., II.	35	441	11,991	345·2	45·3	870	160·0	2100	26,596	14·2	1733	11·2	1433	8·8	1219	7·2
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	237·5	2400	34,738	19·8	1994	13·3	1649	10·5	1376	8·3
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	305·0	2600	40,768	18·5	2171	14·8	1801	11·7	1500	9·3
12-in. B.L.R.	V.	45	553	16,974	452·0	52·9	870	305·0	2700	43,964	19·4	2259	15·5	1877	12·3	1561	9·8
12-in. B.L.R.	VI.	45	553	14,970	452·0	53·6	870	340·0	2850	48,984	20·8	2393	16·6	1991	13·3	1653	10·6
12-in. B.L.R.	VII.	50	607	14,296	506·3	56·1	870	340·0	2950	52,483	25·7	2483	17·5	2071	13·9	1719	11·0
13-in. B.L.R.	I., II.	35	479	15,068	374·9	61·4	1130	180·0	2000	31,333	15·0	1679	12·0	1414	9·7	1221	8·1
14-in. B.L.R.	I.[1]	45	642	..	..	63·6	1400	365·0	2600	65,606	28·3*	..	23·4*	..	..	..	..
14-in. B.L.R.	II.[2]	50	700	..	..	82·2	1400	..	2800	76,180	..	..	27·4	..	..	..	..

[1] Pennsylvania class. [2] New Mexico class. For the 16-in. gun see the Bethlehem table, *post*.

* Harveyized armour. † A short anti-aircraft 3-in. gun is mounted in many of the ships. ‡ There is now a 4-in. 50-cal. anti-aircraft gun.

§ All battleships from the Delaware class onward have this gun for torpedo defence.

Corrected to April, 1919.

DUTCH NAVAL ORDNANCE.

	Krupp Q.F.											Skoda Q.F.
Designation by Calibre, in centimètres	28[1] Q.F.	24[2] Q.F.	24[3] Q.F.	15 Q.F.	15 Q.F.	15 Q.F.	15 Q.F.	12 Q.F.	10·5 Q.F.	7·5 Q.F.	7·5 Q.F.	7·5 Q.F.
Calibre, in inches	11·0	9·4	9·4	5·9	5·9	5·9	5·9	4·72	4·1	3·0	3·0	3·0
Total Length, in feet	39·2	31·5	31·5	19·55	19·55	19·55	25·9	15·75	18·5	9·8	13·5	7·4
Length of Rifled Portion of Bore, in inches	356	289	286	184	183	174	239	149	165	88	132	61
Length of Powder Chamber „	80	58	61	30	32	41	51	24	39	17	17	17
Length of Bore, in Calibres	40	37	37	37	37	37	50	37	50	37	55	27
Number of Grooves	80	72	72	44	44	44	48	36	32	28	32	22
Depth of Grooves, inches	0·11	0·06	0·06	0·06	0·06	0·06	0·06	0·06	0·05	0·03	0·03	0·03
Twist of Rifling, in Calibres	50·30	45·25	45·30	45·25	45·25	45·30	30	45·25	50·35	45·25	50·35	25
Total Weight, in tons	31 0	24·5	24·5	4·85	4·88	5·23	7·34	2·40	2·44	0·8	0·92	0·5
Firing Charge — Armour-piercing Projectile, in lb.	206	111	118	16	19	28	37	9	14	3	4	3
Firing Charge — Common Shell „												
Weight — Armour-piercing Projectile „	595·24	374·80	374·80	100	90·38	90·38	101·4	52·35	39·68	12·90	12·90	12·90
Weight — Common Shell „												
Weight — Case Shot „												
Bursting Charge — Armour-piercing Projectile „	34	21	20	5	6	6	8	2	2	0·3	0·3	0·3
Bursting Charge — Common Shell „												
Muzzle Velocity, feet	2920	2690·5	2789	2231	2444	2789	2953	2231	2930	2231	2936	2034
Muzzle Energy — Total, in foot-tons	35,191	18,809	20,210	3469	3744	4874	6140	1807	..	..	..	..
Muzzle Energy — Per inch Circumference, foot-tons	1018	603	684	182	202	260	331	122	..	..	..	..
Perforation at Muzzle, in inches (Krupp Steel)	24·25	18·1	19·1	6·5	9·8	11·5	..	4·7	..	..	..	..
Perforation Krupp Steel, 3000 yards	18·50	14	14·2	3·9	5·7	7·1	..	..	..	..	..	..
Model	1909	1900	1905	1899	1900	1905	1919	1899	1912	1901	1910	1912

[1] De Zeven Provincien. [2] Koningin Regentes. [3] Heemskerck, Tromp.

Corrected to April, 1919.

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DANISH NAVAL ORDNANCE.

Designation by Calibre, in centimètres, length in calibres, and type of gun	24 L. 40 1893 Krupp.	24 L. 40 1896 Canet.	24[1] L. 43 1901 Bofors.	24[2] L. 43 1906 Bofors.	15 L. 43 1896 Bofors.	15 L. 43 1901 Bofors.	15 L. 50 Bofors.	12 L. 40 Krupp.	8·7 L. 40 Krupp.	7·5 L. 55 Danish semi-aut.	5·7 L. 44 Hotchkiss.	5·7 L. 30 Danish semi-aut. A.A.	4·7 L. 44. Hotchkiss.	4·7 L. 50 Danish semi-aut.
Calibre, in inches	9·45	9·45	9·45	9·45	5·87	5·87	5·87	4·72	3·43	2·95	2·24	2·24	1·85	1·85
Total length, in feet	31·50	31·50	33·86	33·86	21·17	21·17	24·46	15·75	11·41	13·53	8·13	5·61	6·72	7·71
Length of Bore, including Powder Chamber — in inches	349·7	358·5	397·0	397·0	244·0	247·4	286·4	176·4	126·8	152·6	89·8	61·0	74·1	87·6
Length of Bore, including Powder Chamber — in calibres	37·0	37·9	42·0	42·0	41·6	42·1	48·8	37·3	37·0	51·7	40·0	27·1	40·0	47·3
Number of Grooves	72	60	60	60	44	44	44	36	32	28	24	24	20	20
Twist of Rifling, in calibres	00–25	72–33	72–33	33	70–30	70–30	30	42–25	45–20	30	180–30	40–25	25	40–25
Total weight, including Breech-gear, tons	25·4	22·9	24·3	24·5	5·5	5·5	7·5	2·26	1·13	0·87	0·36	0·135	0·23	0·32
Weight of Breech Block, lb.	1691	871	851	802	295	252	313	205	136	83	60	46·2	40	40
Weight of Armour-piercing Projectile, lb.	353	353	353	353	112	112	112	..	..	..	..	..	..	..
Weight of „ Shell „	353	353	353	353	112	112	112	44	20	15	6	6	6·3	3·3
Weight of Common Shell, lb.	353	353	353	353	112	112	112	44	20	15	6	6	3·3	3·3
Weight of Bursting Charge — Armour-piercing Shell, lb.	5·3	5·3	5·3	5·3	1·7	1·7	1·7	1·7	0·7	0·7	0·25	0·25	0·11	0·11
Weight of Bursting Charge — Common Shell, lb.	24·9	24·9	21·4	21·4	7·2	7·2	7·2	2·8	1·3	0·7	0·19	0·19	0·14	0·14
Weight of Firing Charge, lb.	91·5	77·2	83·8	97·0	22·0	22·5	34·2	11·3	4·7	4·0	1·3	0·91	1·1	1·4
Muzzle Velocity, feet	2362	2362	2500	2500	2297	2297	2690	2362	2362	2625	2297	1640	2346	2723
Muzzle Energy — Total foot-tons	13640	13640	15450	15450	4100	4100	5642	1702	767	737	218	113	126	170
Muzzle Energy — Per inch circumference, foot-tons	459·5	459·5	520·8	520·8	222·4	222·4	306·1	114·8	71·2	79·5	31·0	16·1	21·7	29·3
Perforation at Muzzle, wrought iron, Tresidder's formula, inches	26·6	26·6	29·2	29·2	18·3	18·3	23·2	13·3	10·5	11·7	6·8	3·7	5·8	7·2
Perforation Krupp Steel, 3000 yards, inches	9·1	9·1	10·4	10·4	6·2	6·2	7·9	..	..	..	..	..	..	..

[1] Olfert Fischer. [2] Peder Skram. There are also some older 1·46-in. 1-pdr. Hotchkiss guns. Corrected to April, 1919. *See* also Bofors Tables.

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NAVAL ORDNANCE OF SWEDEN.

—	Bofors.	Armstrong.		Canet and Bofors.	Armstrong.	Whitworth.	Bofors.		Bofors.			Bofors.	Bofors.	Stockholms Vapenfabrik and Finspong.		Bofors.	Finspong.	Stockholms Vapenfabrik.		Finspong.	Stockholms Vapenfabrik.	
N. = belongs to the Navy. C.A. = belongs to the Coast Artillery.	28 cm.k. m/12	25 cm.k. m/85	25 cm.k. m/89	25 cm.k. m/94	24 cm.k. m/90	24 cm.k. m/92	24 cm.k. m/96	24 cm.k. m/04	21 cm.k. m/98	15 cm.k. m/98	15 cm.k. m/03 and m/12	12 cm.k. m/94 and m/97	12 cm.k. m/03 and m/11	7·5 cm.k. m/05 and m/12	5·7 cm.k. m/89 B and m/99	5·7 cm.k. m/92	5·7 cm.k. m/95 ⊙ B1/95B	5·7 cm.k. m/95 C.	5·7 cm.k. m/95 D.	4·7 cm.k. m/92	4·7 cm.k. m/95	3·7 cm.k. m/98 B
	N.	C.A.	C.A.	N.	C.A.	C.A.	C.A.	C.A.	N.	N.C.A.	N.C.A.	N.C.A.	C.A.	N.	N.C.A.	N.C.A.	C.A.	C.A.	N.	C.A.	N.	N.C.A.
Designation by Calibre, in cms.	28·3	25·4	25·4	25·4	24	24	24	24	21	15·24	15·24	12	12	7·5	5·7	5·7	5·7	5 7	5·7	4·7	4·7	3·7
Total Length . . . . . mm.	12735	8636	8636	10670	8237	8544	10320	12000	9335	6768	7620	5400	6000	3970	3108	2760	1478	1504	1900	1200	2572	1450
Length . Rifled Portion of Bore . mm.	10515	6637	6550	8498	6353	6618	8541	10009·3	7801·1	5693	6265·9	4665	5013	3129	2517·5	2328	1049·5	1049·5	1447·5	817·3	2034·5	1126
Length . Chamber	1660	1397	1397	1609	1209	1373·1	1299·6	1508·4	1123	787·7	1049·9	474	742	560·5	265	229	205	205	200	175	2572	133·4
Length . Bore, in calibres . . .	44	32	32	40·5	32·4	33·5	41	48	42·5	42·5	48	43	48	49	49	41·5	22	23	30	22	49	34
Number of Grooves	80	42	42	44	42	40	40	40	60	44	44	36	36	28	24	24	24	24	24	24	20	16
Twist of Rifling	28	40	40	30	30	30	30	30	30	30	30	30	30	30	30	30	25	25	27	25	30	30
Total Weight . . . . . tons	34·4	30·25	31·03	29·2	23·84	28·1	25	30·44	17·00	5·98	7·75	2·8	3·7	0·950	0·380	0·334	(0·216) (0·206)	0·212	0·189	0·116	0·243	0·0773
Weight . Armour-piercing Shell, in kg.	305	204	204	204	181	215	215	215	125	45·4	45·4	21	21	—	—	—	—	—	—	—	—	—
Weight . Common Shell . . kg.	—	182	182	182	181	215	215	—	—	—	—	21	21	6·5	2·722	2·722	2·722	2·722	2·722	1·5	1·5	0·8
Weight of Firing Charge . Armour-piercing Shell, in kg.	100	41	41	45·2	34	45·5	43	53	30	10·3	15	4·3	7·0	—	—	—	—	—	—	—	—	—
Weight of Firing Charge . Common Shell . . kg.	—	31·5	31·5	—	—	—	—	—	—	—	—	4·3	7·0	1·3	0·435	0·34	0·24	0·24	0·365	0·143	0·3	0·08
Muzzle Velocity . . . . . m.	870	640	640	770	625	640	685	785	750	750	850	740	860	780	704	640	485	485	600	468	740	550
Muzzle Energy, total m. ton. . . .	11288	4258	4258	5386	3009	4209	5138	6575	3581	1301	1671	586	791	201	68·7	56·8	32·64	32·64	49·9	16·73	41·80	12·3
Perforation (K.C. armour, 3000 m.), in cms.	—	14·6	14·6	20·6	13·4	19·0	21·8	35·9	22·9	10·4	15·7	—	10·5	—	—	—	—	—	—	—	—	—

For the 11-in. and 12-in. guns, and details of some of the others, *see* the Bofors Company's table, *post*.

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NAVAL ORDNANCE OF NORWAY.

	Modern Guns.							
Designation by Calibre, in cms.	21	21[1]	15	15	12	76 mm.	76 mm.	7 cm.
Calibre, inches	8·24	8·24 Q.F.	5·87	5·87 Q.F.	4·7 Q.F.	3·0	3·0	2·8
Total Length, feet	24·0	31·2	19·6	23·3	17·7	10·3	13·3	9·2
Length — Rifled Portion of Bore, inches	212·3	309·7	178·0	234·1	179·2	102·4	127·7	81·8
Length — Chamber, inches	49·0	48·6	39·0	32·9	26·0	15·4	20·4	19·1
Length — Bore in calibres	35·0	43·8	37·2	45·8	44·0	40	50	36·6
Number of Grooves	64	32	44	28	26	16	28	28
Twist of Rifling	46–23	∝–30	45–25	∝–30	∝–30	∝–30	30	20
Total Weight, tons	14·2	18·9	5·6	7·1	2·7	0·6	1·0	0·63
Weight of — Armour-piercing Shell, in lb.	309	309	112·4	99·3	45	12·5	12·5	10·5
Weight of — Common Shell, in lb.	..	..	..	..	..	..	..	..
Weight of * Firing Charge — Armour-piercing Shell, in lb.	45·6	54	20·4	20·9	9·4	2·2	3·75	2·2
Weight of * Firing Charge — Common Shell, in lb.	..	..	..	..	..	..	..	..
Muzzle Velocity, feet	1903	2300	2050	2625	2570	2200	2840	2230
Muzzle Energy, Total foot-tons	7760	11450	3328	4870	2060	430	695	367
Perforation through Iron by Tresidder's formula	19·3	25·6	15·4	21	15·3	8·0	11·6	7·8
Perforation, Krupp Steel, 3000 yards	4¾	6½	3¼	4	..	..	..	..

* Smokeless powder.

Corrected to April, 1919.

[1] Norge and Tordenskjold classes.

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ELSWICK B.L. AND Q.F. GUNS.

This Table is supplied by the Manufacturers.

	Automatic for Aircraft.				Semi-Automatic			Semi-Automatic	Non-recoil.		Naval Landing.	Balloon Attack		Semi-Automatic	Jointed Gun.		Semi-Automatic	
Diameter of Bore .....ins.	1·457	1·457	0·9	1·85	1·85	1·85	2·24	2·24	2·24	2·953	3	3*	3	3	3	4	4	4·7
do. do. .....mm.	37	37	22·86	47	47	47	57	57	57	75	76	76	76	76	76	102	102	120
Length of Bore .....cals.	45	40	66	40	46	50	40	50	27	14·13	18·8	28	50	50	19·2	50	40	45
	lb.	lb.	lb.	cwts.	cwts.	cwts.	cwts.	cwts.	lb.	cwts.	cwts.	cwts.	cwts.	cwt.	cwts.	cwts.	cwts.	cwts.
Weight of Gun	340	230	230	4·51	5 0	7·5	7·5	10·5	329	1·875	4	8	17·75	23	4·5	42	27	53
do. do. .....kilos.	154	104	104	230	254	381	381	533	149	95	203	406	901	1168	229	2134	1360	2692
do. Projectile .....lbs.	1·5	1·5	6 oz.	3·3	3·3	3·3	6	6	6	11·75	12·5	12·5	12·5	14·33	14·33	31	31	45
do. do. .....kilos.	0·681	0·681	0·17	1·5	1·5	1·5	2·722	2·722	2·72	5·33	5·67	5·67	5·67	6·5	6·5	14·06	14·06	20·41
	oz.	oz.	oz.	oz.	oz.	lb. oz.	oz.	lb. oz.	oz	oz.	oz.	lb.	lb. oz.	lb.	ozs.	lb.	lb.	lb. oz.
do. Charge, M.D. Cordite	2¼	2¼	1¼	8·25	10·0	1 0	10	1 2 5	7¾	7·75	15	1·1	3 0	5·75	15	10·5	5·0	9 11
do. do. do. kilos.	0·071	0·071	0·042	0·234	0·283	0·453	0·283	0·525	0·22	0·22	0·369	0·5	1·36	2·603	0·425	4·76	2·27	4·395
Muzzle Velocity .....f.s.	2035	2000	2800	2132	2300	2680	1968	2400	1000	1100	1585	1610	2600	3050	1485	3000	2300	2600
do. do. .....m.s.	620	609	853	650	701	817	600	731	305	335	483	500	792	930	452	914	701	792
Muzzle Energy .....f.t.	43	41·6	20·4	104	121	164	161	240	41·6	98	213	233	586	922	218	1934	1137	2109
do. do. .....m.t.	13·3	12·8	6·3	32·2	37·5	50·8	49·8	74·3	12·8	30·3	66	72	181·5	285·5	67·5	599	352	653
Penetration at Muzzle ...ins. (Tresside Wrought Iron Pl.)	3·5	3·4	3·6	5·15	5·8	7 3	5.4	7·3	1·95	..	..	5·1	10·3	13 7	..	17·4	11·6	15·6
do. do. ...mm.	88·9	86·3	91·4	130·8	147·3	185·4	137·2	185·4	49·5	..	..	129·5	261·6	348·0	..	442·0	294·6	396·2
Rounds per Minute	70	70	80	25	30	30	25	30	..	20	20	20	20	25	15	12	20	12

Diameter of Bore .....ins.	4·7	5	5·5	6	6	7·5	7·5	8	8	9·2	9·2	10	10	12	12	13·5	14	15	15
do. do. .....mm.	120	127·2	139·7	152	152	190	190	203	203	234	234	254	254	305	305	343	355·6	381	381
Length of Bore .....cals.	50	45	50	45	50	45	50	45	50	45	50	45	50	45	50	45	45	40	45
	cwts.	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
Weight of Gun	66	4·05	5·65	8·4	8·75	13·8	15·75	18·0	20·4	26·75	29·82	36·25	38·25	59·3	66·7	76	85	85	98·6
do. do. .....kilos.	3353	4114	5740	8535	8890	14021	16003	18289	20727	27179	29289	36832	38864	60252	67770	77216	86364	86364	96118
do. Projectile .....lbs.	45	60	83	100	100	200	200	250	250	380	340	500	500	850	850	1250	1400	1920	1925
do. do. .....kilos.	20·41	27·2	37·6	45·36	45·36	90·72	90·72	113·4	113·4	172·37	172·37	226·8	226·8	385·55	385·55	567	635	871	873·2
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
do. Charge, M.D. Cordite	14	16	25·0	31	33·0	74	76	80	90	122	136	167	200	260	285	296	324	380	400
do. do. do. kilos.	6 35	7·25	11·34	14·061	15·0	33·566	34·473	36 29	40·82	55 34	61·7	75·75	90·72	117·93	129·3	134·26	147	172·3	181
Muzzle Velocity .....f.s.	3000	2700	2900	2800	3000	2900	3000	2845	3000	2750	3000	2800	3000	2800	3000	2700	2700	2762	2500
do. do. .....m.s.	914	823	884	853	914	884	914	867	914	838	914	853	914	853	914	823	823	720	762
Muzzle Energy .....f.t.	2808	3032	4840	5436	6240	11663	12481	14031	15600	19926	23714	27181	31203	46208	53046	63187	70770	74275	83425
do. do. .....m.t.	869·6	939	1499	1683·4	1932	3611·9	3865·2	4345·2	4831·2	6171	7340	8418	9663	14310	16428	19568	21916	23002	25835
Penetration at Muzzle ...ins. (Tresside Wrought Iron Pl.)	19·3	18·4	25·8	22·9	25·5	30·6	32·3	32·2	34·9	35·2	40·1	39·7	44·1	47·3	52·5	51·3	53·2	49·1	53·7
do. do. ...mm.	490·2	724	701·0	581·6	647·7	777·2	820·4	817·9	886·4	894·1	1018·5	1008·4	1120·1	1201·4	1333·5	1303·0	1351·3	1247	1364
Rounds per Minute	12	10	10	9	9	6	6	5	5	4	4	3	3	2	2	2	2	2	2

Corrected to May, 1919.

* This gun can be arranged for anti-torpedo boat attack also.

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ELSWICK HOWITZER, FIELD AND TRENCH GUNS.

This Table is supplied by the Manufacturers.

	Mountain Gun.	Field.	Horse and Field.	Field.	Howitzers.			Field Position.	Howitzers.						Bomb Thrower	Howtzr.	Trench Howtzr.	Trench Howtzr.	Stick Bomb Thrower	Anti-Aircraft.	Tank.
Diameter of Bore ... ins.	2·953	3	3	3·3	4	4·3	4·7	5	5	6	8	9·2	11	11·24	13·5	12	11	5	3·5	3	2·244
,, ,, ... mm.	75	76	76	84	102	109·2	120	127	127	152	203	234	279·4	285·5	342·9	304·8	279·4	127	88·9	76·2	57
Length of Bore ... calibres	15·2	28	23	28	8·75	12·5	12	32	8·4	12·2	12	13·7	12	15	..	17·3	5	5·4	..	45	23
	lb.	cwt.	cwt.	cwt.	lb.	cwt.	cwt.	tons	cwt.	ton	tons	tons	tons	tons	lb.	tons.	lb.	lb.	lb.	cwt.	cwt.
Weight of Gun	260	7·25	6	9	220	7	8	2	9	1	2·6	4·3	5·5	7·85	973	10·5	1481	252	863	20	5
,, ,, ... kilos.	118	368	305	457	100	356	406	2032	457	1016	2642	4369	5588	7976	441	10,668	672	114	391	1016	254
,, Projectile lbs.	12·5	14·3	12·5	18·5	20	40	35	60	50	100	240	290	500	661·38	200	760	200	40	200	12·5	6
,, ,, kilos.	5·67	6·49	5·67	8·39	9·07	18·14	15·87	27·22	22·68	45·36	108·9	131·5	227	300	90·7	340·2	90·7	18	90·7	5·6	2 722
	oz.	oz.	lb. oz.	lb. oz.	oz.	oz.	lb. oz.	lb. oz.	oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	oz.	lb. oz.	lb. oz.	oz.
,, Charge M.D. Cordite	10	20¼	1 4	1 6	8¼	16¼	1 4¼	9 8	12	3	7·5	14	20	32	1¼	49	1	3½	2 10	2 10	8¼
,, ,, ,, kilos.	0·283	0·582	0·567	0·624	0·241	0·461	0·582	4·31	0·34	1·361	3·4	6·35	9·07	14·51	·6	22·2	454	·1	1·2	1·2	·248
Muzzle Velocity ... ... f.s.	1250	1755	1700	1635	950	980	1150	2150	782	1000	1000	1250	1220	1230	380	1470	400	429	355	2575	1580
,, ,, ... m.s.	381	535	518	498	290	298	350	655	238	305	305	381	372	375	115·8	448	122	130·7	108·2	784·8	481·5
Muzzle Energy .....f.t.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	200	11,238	222	51	174·7	574·7	103·9
do. do. .....m.t.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	61·9	3480	68·7	15·8	54·1	178	32·2
Penetration at Muzzle ...ins.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16·9	..	..	..	10·1	3·9
(Tessider Wrought Iron Pl.)																					
do. do. mm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	429·2	..	..	..	256·5	99
Rounds per Minute.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	20	25

Corrected to May, 1919.

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VICKERS' GUNS AND MOUNTINGS.

This Table is supplied by the Manufacturers.

		37 m/m Auto.	37 m/m Auto.	40 m/m Auto.	3-pdr. Semi-Auto.	6-pdr. Semi-Auto.	3-in. Semi-Auto.	4-in. Semi-Auto.	4-in. Semi-Auto.	4-in. B.L.	4·7-in. B.L.	4·7-in. B.L.	4·7-in. Q.F. Naval Howitzer.	5·118-in. B.L.	6-in. B.L.	6-in. B.L.	6-in. Semi-Auto.
		30 cal.	42·5 cal.	40 cal.	50 cal.	50 cal.	50 cal.	40 cal.	45 cal.	50 cal.	45 cal.	48·5 cal.	18 cal.	54 cal.	45 cal.	50 cal.	50 cal.
Construction	ins.	S.	S.	S.	S.	S.	S.	S. & W.	S. & W.	S. & W.	S. & W.	S.	S.	S.	S. & W.	S. & W.	S. & W.
Diameter of Bore	ins.	1·457	1·457	1·575	1·85	2·244	3	4	4	4	4·724	4·724	4·724	5·118	6	6	6
Length of Bore	ins.	43·5	62	62	92·5	112·2	150	160	180	201·15	212·6	228·45	85	276·37	269·5	300	300
Length of Gun	ins.	73·75	94	95·7	98·9	118·6	157	166·6	187·8	208·45	220	236·2	89·9	281·5	279·228	310·07	311·17
		lb.	lb.	lb.	cwt.	c. q.	cwt.	cwt.	cwt.	cwt.	t. c.	t. c.	c. q.	t. c. q.	t. c. q.	tons	t. c.
Weight of Gun		432	551	616	6	9 2	19	25	43	41	3 4	3 2	11 1	5 3 2	7 8 2	8	8 19
Weight of Projectile	lb.	1	1·5	2	3·3	6	12·5	31	31	31	45	45·14	45	81·26	100	100	100
Muzzle Velocity	f.s.	1800	2100	2000	2800	2600	2700	2300	2700	3030	2800	8050	1200	2700	2900	3100	2900
Muzzle Energy	f.t.	22·5	46	55·5	180	280	630	1135	1565	1975	2445	2910	450	4105	5830	6665	5830
Penetration of Wrought Iron Plate at Muzzle, Gavre formula. Uncapped Projectiles	ins.	..	..	..	6·7	7·5	9·65	10·8	13·6	16	15·9	17·8	..	20·8	22·6	24·8	22·6
Rounds per minute		200	200	200	30	28	25	20	18	15	12	12	10	10	10	10	8
Weight of Mounting complete with Shield	lb.	800	800	1000	c. q. lb. 11 2 5	c. q. lb. 17 3 10	t. c. q. lb. 1 3 1 10	t. c. q. lb. 2 9 2 21	t. c. q. lb. 2 18 3 3	t. c. q. lb. 3 5 0 27	t. c. q. lb. 3 15 0 5	t. c. q. lb. 9 1 21	t. c. q. lb. 4 1 2 11	t. c. q. lb. 12 9 3 13	t. c. q. l. 12 9 2 3	t. c. q. lb. 14 17 2	t. c. q. lb. 12 0 1 24
Weight of shield		..	..	..	1 0 20	1 2 10	2 0 14	7 2 0	7 2	14 1 13	15 2 1	12 2 0	2 0 0 4	4 4 3 16	4 4 3 16	6 5 0	5 5 1 15
Thickness of Shield	ins.	..	..	..	·22	·25	·25	·144	·144	·25	·25	3	1·9	1·5 & 1	1·5 & 1	4 to 1·2	3 to 1·2
Angle of Elevation	deg.	80	80	80	20	20	20	30	30	30	30	30	70	30	30	30	15
Angle of Depression	deg.	10	10	5	10	10	10	10	10	10	10	10	5	5	5	7	7

		8-in. B.L.	9·2-in. B.L.	9·2-in. B.L.	10-in. B.L.	10-in. B.L.	11-in. B.L. Naval Howitzer.	12-in. B.L.	12-in. B.L.	13·5-in. B.L.	14-in. B.L.	14-in. B.L.	15-in. B.L.	15-in. B.L.	16-in. B.L.	16-in. B.L.	16-in. B.L.
		48·52 cal.	45 cal.	50 cal.	45 cal.	48·6 cal.	8 cal.	45 cal.	50 cal.	45 cal.	45 cal.	50·42 cal.	40 cal.	45 cal.	40 cal.	43·65 cal.	45 cal.
Construction		S.	S. & W.	S. & W.	S. & W.	S.	S.	S. & W.	S. & W.	S. & W.	S. & W.	S.	S. & W.	S. & W.	S. & W.	S.	S. & W.
Diameter of Bore	ins.	8	9·2	9·2	10	10	11	12	12	13·5	14	14	15	15	16	16	16
Length of Bore	ins.	388·2	414	461·4	450	486	88	540	600	607·5	630	705·88	600	675	640	698·45	720
Length of Gun	ins.	400	427·03	474·4	464·6	500	96·6	557·55	617·7	625·9	648·4	728	620·3	695·3	661·25	720	741·25
		t. c. q.	t. c. q.	t. c. q.	t. c.	t. c. q.	t. c.	t. c.	t. c.	t. c. q.	t. c.	tons	t. c.	tons	tons	t. c.	tons
Weight of Gun		14 3 1	26 11 3	28 6 2	34 17	27 16 3½	1 18	57 14	66 14	76 12 1	83 9	82	82 10	97	100	107 14	117
Weight of Projectile	lb.	247·4	380	380	500	496·6	350	850	850	1400	1488	1647	1900	1900	2240	2461·2	2240
Muzzle Velocity	f.s.	3000	2800	2900	2780	2863	585	2850	3010	2500	2525	2700	2350	2500	2350	2500	2450
Muzzle Energy	f.t.	15440	20660	22160	26800	28225	682	47875	53400	60670	65790	83255	72750	82340	85780	106665	93230
Penetration of Wrought Iron Plate at Muzzle. Gavre Formula. Uncapped Projectile	ins.	33·2	35·3	37	38·9	40·2	—	48·3	52·1	50	51·5	60·7	51	56	54	63	57
Rounds per minute		6	4	4	3	3	4	2	2	1·5	1·35	1·35	1·2	1·2	1·2	1·2	1·2

Corrected to April, 1919.

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VICKERS' GUNS AND MOUNTINGS.

AIRCRAFT AND ANTI-AIRCRAFT GUNS.

	Aircraft.									Anti-Aircraft.							
	·303-in. Auto.	·5-in. Auto.	1-in. Auto.	37 m/m. 1-pdr. Auto.	40 m/m. 2-pdr. Auto.	37 m/m. Semi-Auto.	40 m/m. Q.F.	40 m/m. Semi-Auto.	6-pdr. Q.F.	37 m/m. 1-pdr. Auto.	37 m/m. 1·5-pdr. Auto.	40 m/m. 2-pdr. Auto.	3-pdr. Semi-Auto.	3-in. Q.F.	3·3-in. Q.F.	4-in. Semi-Auto.	4-in. B.L.
	9·3·7 cal.	60 cal.	30 cal.	22 cal.	42·5 cal.	26·1 cal.	25·1 cal.	40 cal.	25 cal.	30 cal.	42·5 cal.	40 cal.	50 cal.	45 cal.	50 cals.	45 cal.	50 cal.
Construction	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S. & W.	S. & W.	S. & W.	S. & W.
Diameter of Bore . ins.	·303	·5	1	1·457	1·575	1·457	1·575	1·575	2·244	1·457	1·457	1·575	1·85	3	3·3	4	4
Length of Bore . ,,	28·4	30	30	32·05	62	38·06	39 56	63	56·1	43·5	62	62	92·5	135	165	180	200
Length of Gun . ,,	41·3	46·5	55	59·7	108	40·25	41·75	65·25	59·5	73·75	94	95·7	98·9	140·25	170 3	187·8	208·45
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	cwt.	c. q.	t. c. q.	t. c.	t. c. q.
Weight of Gun . . .	30	50	110	130	400	110	132	234	284	·432	551	616	6	19 3	1 13 2	2 3	2 1 3
Weight of Projectile . lb.	174 grs.	570 grs.	·441	1	2	1·5	2	2	6	1	1·5	2	3·3	12·5	21	31	31
Muzzle Velocity . . f.s.	2400	2600	1512	1200	2000	1200	1200	2300	1200	1800	2100	2000	2800	2600	2400	2700	30·30
Muzzle Energy . . f.t.	1	3·8	7·25	10	55·5	15	20	73	60	22·5	46	55·5	180	585	840	1565	1975
Rounds per minute . . .	500 to 1000	500 to 1000	200	150	100	—	—	—	—	200	200	200	30	25	20	18	15
	—	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	c. q. l.	t. c. q. l.	t. c. q. l.	t. c. q. l.
Weight of Mounting . .	—	25	65	100	140	333	130	432	185	800	800	1000	2	18 2 3	2 8 3 0	4 8 2 2	3 3 8 0
Angle of Elevation . deg.	—	80	40	60	72	30	70	60	60	80	80	80	80	85	85	80	80
Angle of Depression . ,,	—	30	90	60	30	30	40	30	90	10	10	5	5	10	0	5	5

HOWITZERS, FIELD, MOUNTAIN AND LANDING GUNS.

	Howitzers.				Field.					Mountain.		Landing.
	6-in. B.L.	8-in. B.L.	9·2-in. B.L.	12-in. B.L.	3-in. Q.F.	3-in. Q.F.	3·3-in. Q.F.	5-in. B.L.	6-in. B.L.	75-mm. Q.F.	3-in. Q.F.	3-in. Q.F.
	21 cal.	17·3 cal.	17·3 cal.	17·3 dal.	21·7 cal.	33·2 cal.	28·1 cal.	37 cal.	35 cal.	16 cal.	14·3 cal.	22 cal.
Construction	S. & W.	S. & W.	S. & W.	S. & W.	S.	S.	S. & W.	S. & W.	S. & W.	S.	S.	S.
Diameter of Bore . ins.	6	8	9·2	12	3	3	3·3	5	6	2·953	3	3
Length of Bore . ins.	126	138·4	159·16	207·6	64·96	99·5	92·735	185	210	45·66	42·94	66
Length of Gun . ins.	134·15	148·3	170·51	222·35	69·3	103·8	96·96	192·25	219·22	50	47·23	70·34
	t. c. q.	t. c.	t. c. q.	t. c. q.	c. q.	c. q.	c. q.	t. c. q.	t. c. q.	c. q.	c. q. l.	c. q. l.
Weight of Gun . . .	1 19 2	3 7	4 5 2	9 2 2	4 2	7 2	8 2	2 3 1	4 11 2	3 2	2 2 4	3 3 18
Weight of Projectile lb.	86	200	290	750	12·5	14·33	18 5	60	100	14·33	12·5	12·5
Muzzle Velocity . f.s.	1760	1520	1520	1520	1600	1660	1650	2200	2400	1150	1150	1640
Muzzle Energy . f.t.	1845	3205	4645	12015	220	274	350	2015	3995	131	115	233
Rounds per minute . .	3	2	2	1	25	25	20	4	3	15	15	25
Weight of Mounting complete with Shield .	t. c. q.	t. c.	t. c.	t. c.	c. q. l.	c. q. l.	c. q. l.	t. c. q.	t. c. q.	c. q. l.	c. q. l.	c. q. l.
	2 16 2	5 14	11 5	36 10	11 3 0	14 0 9	19 2 0	2 17 0	5 12 0	7 0 0	7 1 5	9 2 0
Weight of Shield . .	—	—	—	—	3 10	1 0 15	1 3 0	—	—	3 22	2 17	1 1 15
Thickness of Shield ins.	—	—	—	—	·125	·144	·125	—	—	·128	·125	·192
Angle of Elevation deg.	42	45	50	65	16	16	37·5	42	38	30	25	23
Angle of Depression deg.	0	0	0	0	6	10	5	0	0	10	15	10

Corrected to April, 1919.

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BEARDMORE GUNS.

This Table is supplied by the Manufacturers.

(April, 1919.)

Gun Calibre.	Length of Bore.	Weight of Gun.	Weight of Shot.	Muzzle Velocity.
inches.	calibres.	tons cwts.	lbs.	ft. secs.
15·0	42·0	90 0	1850	2550
13 5	46·0	77 0	1375	2620
12·0	50·0	66 0	·950	2820
9·2	50·0	28 10	425	2810
7·5	45·0	13 18	200	2800
6·0	50·0	8 14	100	2950
6·0	45·0	6 18	100	2800
5·0	50·0	4 6	60	2950
4·7	45·0	3 4	45	2750
4·0	50·0	2 3	31	3000
4·0	45·0	2 2	31	2800
3·3	29·5	0 9	185	1700
3·0	40·0	0 12	125	2250
2·24	23·2	0 5	6	1525
Auto-Aircraft Gun.		lbs.		
1 45	19·0	95	1	1400

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COVENTRY ORDNANCE WORKS GUNS.

This Table is supplied by the Manufacturers.

		Automatic Air Craft.		3-pdr., 50 cal.	6-pdr., 50 cal.	Mountain 3·3-in. 20-pdr., Howitzer.	Field.				3-in., 50 cal.	4-in., 40 cal.	4-in., 50 cal.	4·7-in., 50 cal.	5·5-in., 50 cal.	6-in., 50 cal.	7·5-in., 50 cal.	12-in., 50 cal.	13·5-in., 45 cal.	14-in., 45 cal.	15-in., 45 cal.
		37 m/m.	75 m/m.				18-pdr., 33·44 cal.	4·65-in. Howitzer.	6-in. Howitzer.	15 in. Howitzer.											
Diameter of Bore .	in.	1·457	2·953	1·85	2·244	3·3	3·0	4·65	6·0	15·0	3·0	4·0	4·0	4·7	5·5	6·0	7·5	12·0	13·5	14·0	15·0
	m.m.	37	75	47	57	83·8	76·2	117·5	152·4	381·0	76·2	101·6	101·6	120·0	139·7	152·4	190·5	304·8	342·9	355·6	—
Length of Gun . .	in.	91·8	118	99·0	119·0	45·25	100·34	72·0	101·5	165	154·5	166·4	208	242·5	284·7	310	387·5	617·7	630	648·7	695·4
Weight of Charge .	lb.	0·19	0·46	1·1	1·75	0·5	1·626	1·1	5·0	54·8	5·25	5·25	11·25	16·0	23·5	31·0	71·0	285	290	305	386
Weight of Projectile	lb.	1·45	14·3	3·3	6·0	20·0	15·0	37·5	100	1400	12·5	31	31	45	82	100	200	850	1250	1600	1950
		lb.	lb.	c.	c.	c. q.	c. q.	c. q.	t. c. q.	t. c.	c. q. l.	t. c. q. l.	t. c.	t. c. q.	t. c.	t. c.	t. c.	t.	t. c.	t.	t.
Weight of Gun . . .		200	560	6	10	2 2	8 2	8 2	1 2 2	10 15	18 2 21	1 5 3 15	2 2	3 14 2	6 4	8 15	15 10	67	76 10	81	106
Muzzle Velocity .	f.-sec.	2000	984	2800	2800	860	1850	1000	1120	1117	3000	2300	3000	3000	2950	2950	2950	2950	2600	2450	2450
Muzzle Energy .	f.-tons	40·2	96	179·4	326	102	356	260	870	12090	780	1137	1934	2810	4520	6034	12068	51290	58590	66580	81163
Penetration of Wrought-Iron Plate at Muzzle	in.	..	..	..	..	..	..	..	..	..	11·25	10·8	16·0	17·4	21	23·1	29·8	50·65	49·1	51·7	52·5
Penetration of Hard Steel Plate at 5000 yards . .	in.	..	..	..	..	..	..	..	..	..	..	..	..	2·6	4·2	5·5	8·5	18·3	18·3	20·7	21·0

Corrected to April, 1919.

BOFORS GUNS.

Table supplied by the Manufacturers.

Calibre . . . . . cm.	30·5			28			25·4			24			21		
Calibre . . . . . in.	12			11·02			10			9·45			8·27		
Length of Gun . . . . cal.	50	45	40	50	45	40	50	45	40	50	45	40	50	45	40
Length of Gun . . . . in.	600·4	540·3	480·3	551·2	496·1	441	500	450	400	472·4	425·2	378	413·4	372	330·7
Weight of Gun . . . . tons	50	44	40	39	35	30	29	26	23	24	22	19	16	14·4	12·8
Weight of Projectile . . . lb.	981 / 772	981	981	761	761	761	564	564	564	474	474	474	309	309	309
Weight of Charge . . . lb.	266	239	213	205	184	164	153	138	123	129	116	103	84	75·8	67·5
Muzzle Velocity . . . ft.-secs.	2776 / 3140	2625 / 2969	2477 / 2802	2776 / 3140	2625 / 2969	2477 / 2802	2789 / 3140	2638 / 2969	2490 / 2802	2789 / 3140	2638 / 2969	2490 / 2802	2828 / 3150	2677 / 2979	2526 / 2812
Muzzle Energy . . . ft.-tons	52583	47019	41877	40767	36452	32468	30536	27320	24349	25647	22944	20448	17174	15391	13705
Penetration of soft steel plate at muzzle de Marres formula . in.	39·8	36·8	33·9	36·4	33·6	30·9	32·9	30·3	27·9	30·8	98·5	26·2	26·7	24·7	22·7
Number of rounds per minute .	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4

Calibre . . . . . cm.	19·4			15·24			12			10·5			8·7			7·5
Calibre . . . . . in.	7·64			6			4·72			4·13			3·43			2·95
Length of Gun . . . . cal.	50	45	40	50	45	40	50	45	40	50	45	40	50	45	40	50	45	40
Length of Gun . . . . in.	381·9	343·7	305·5	300	270	240	236·2	212·6	189	227·4	206·7	186	188·4	171·3	154·1	162·4	147·6	132·9
Weight of Gun . . . . tons	12·8	11·6	10·3	5·8	5·3	4·7	2·96	2·56	2·37	2·2	2	1·8	1·88	1·14	1·05	0·72	0·665	0·59
Weight of Projectile . . . lb.	251 / 198	251	251	112·4	112·4	112·4	59·5	59·5	59·5	39·7	39·7	39·7	22·7	22·7	22·7	14·5	14·5	14·5
Weight of Charge . . . lb.	68·1	61·3	54·7	53·1	29·8	26·5	16·2	14·5	12·9	10·8	9·7	8·7	6 14	5·53	4·92	3·92	3·53	3·13
Muzzle Velocity . . . ft.-secs.	2786 / 3140	2635 / 2969	2487 / 2802	2897 / 3235	2749 / 3051	2582 / 2884	2789 / 3143	2638 / 2973	2474 / 2805	2871 / 3251	2733 / 3097	2585 / 2933	2864 / 3248	2726 / 3084	2582 / 2936	2848 / 3215	2717 / 3074	2572 / 2907
Muzzle Energy . . . ft.-tons	13566	12136	10815	6565	5913	5215	3220	2881	2567	2267	2057	1841	1292	1169	1049	817	742·7	668·5
Penetration of soft steel plate at muzzle de Marres formula . in.	24·6	22·7	20·9	19	17·6	16·1	14·7	13·6	12·5	13·2	12·3	11·4	10·8	10·1	9·4	9·2	8·5	7·9
Number of rounds per minute .	5	5	5	9	9	9	11	11	11	15	15	15	17	17	17	20	20	20

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BETHLEHEM STEEL CO.

ORDNANCE.

Table supplied by the Manufacturers, May, 1919.

Calibre.	Length of bore in Calibres.	Calibre.	Weight of Gun.	Weight of Projectile.	At Muzzle.		At 3000 yards Range.			At 8000 yards Range.			Limiting ranges beyond which capped armour piercing projectiles will not penetrate hard-faced armour of 12 inches and 7 inches thickness. (Davis Formula.)		Calibre.
					Velocity.	Energy.	Penetration of Wrought Iron. (Gavre Formulæ.)	Dangerous Space for Target 25 feet high.	Energy.	Penetration of Krupp hard-faced armour by capped armour piercing projectiles, with normal impact. (Davis Formula.)	Dangerous Space for Target 25 feet high.	Energy.	Penetration of hard-faced armour by capped armour piercing projectiles, with normal impact. (Davis Formula.)	12-in. plate.	7-in. plate.	
inches.	calibres.	cms.	lbs.	lbs.	ft. per sec.	foot-tons.	inches.	yards.	foot-tons.	inches.	yards.	foot-tons.	inches.	yards	yards.	inches.
1·457	50	3·7	160	1	2150	32	..	..	..	..	..	..	..	..	..	1·457
1·851	50	4·7	550	3	2400	120	..	..	..	..	..	..	..	..	..	1·851
2·244	50	5·7	960	6	2400	240	..	..	..	..	..	..	..	..	..	2·244
3	50	7·62	1900 tons.	13	2800	707	..	..	..	..	..	..	..	..	..	3
4	50	10·16	2·6	33 kilos.	2800	1,793	11·0	320	890	..	..	..	..	..	..	4
4	50	10·16	2·6	14 lbs.	3000	1,924	11·5	362	980	..	..	..	..	..	..	4
5	45	12·7	3·4	50	2600	2,343	11·3	253	1,096	..	..	..	..	..	..	5
5	50	12·7	4·75	50	3000	3,120	13·8	371	1,514	..	..	..	..	..	..	5
6	45	15·24	7·2	105	2600	4,920	16·9	313	2,970	7·0	60	1,307	4·2	..	2,870	6
6	50	15·24	8·4	105	2800	5,707	18·8	374	3,478	7·7	71	1,543	4·6	..	3,890	6
7	45	17·78	12·7	165	2700	8,338	22·0	358	5,426	9·2	74	2,660	5·9	..	6,063	7
7	50	17·78	14·5	165	2900	9,619	24·4	422	6,263	10·1	87	3,130	6·5	..	7,063	7
8	45	20·32	18·6	260	2800	14,460	29·2	410	9,869	12·3	92	5,457	8·5	3,240	10,420	8
8	50	20·32	22·3	260	2900	15,160	30·7	441	10,616	12·9	100	5,885	8·9	3,950	11,235	8
9·2	50	23·37	30·4	380	2900	22,200	35·8	450	15,760	14·9	107	9,350	10·8	7,237	15,311	9·2
10	45	25·4	35·4	515	2800	27,990	40·5	429	21,080	17·2	106	13,160	12·8	9,075	Over 16,000	10
10	50	25·4	43·9	515	2900	30,020	42·6	453	22,671	18·0	114	14,394	13·6	10,000	„	10
12	45	30·48	53·8	870	2800	47,380	51·8	439	36,794	21·7	114	24,608	16·9	14,560	„	12
12	50	30·48	66·0	870	2900	50,720	54·4	476	39,990	23·0	123	26,495	17·7	15,596	„	12
14	35	35·56	57·4	1660	2150	53,190	50·4	244	44,660	22·3	70	33,650	18·7	Over 16,000	„	14
14	45	35·56	70·3	1400	2600	65,700	56·4	362	50,420	24·0	98	39,840	20·7	„	„	14
14*	50	35·56	82·2	1400	2800	76,180	62·0	471	62,100	27·4	117	43,590	21·9	„	„	14
15	45	38·1	90·0	1700	2600	79,760	64·1	390	65,330	27·0	100	46,300	21·8	„	„	15
16	45	40·64	96·0	2100	2500	91,110	67·3	400	75,700	28·5	94	61,130	23·3	„	„	16
18	30	45·72	60·0	2075	2150	66,490	49·4	235	52,750	21·1	63	36,365	16·7	15,100	„	18

Guns of 3-in. calibre or under are chambered for fixed ammunition with the powder and projectiles in brass cartridge cases. Guns from 3-in. calibre upwards, and including the 6-in. L-45 gun, can be chambered to use either fixed ammunition, or chambered to use loose ammunition with the powder in cartridge bags and the projectile separate from the powder. Guns above 6-in. calibre and including the 6-in. L-45 gun are chambered for loose ammunition. The breech mechanisms of all guns up to 8 in. are operated by the single motion of a hand-lever. In addition to the 18-in. calibre guns there are 30-calibre 14-in. and 16-in. guns.

* This is the gun to be mounted in the battleships New Mexico, Idaho and Mississippi.

GERMAN SHIP AND COAST GUNS (KRUPP).

[These guns, as well as some shorter and smaller guns, were included in the latest available German official table.]

Calibre . . . . . cm.	8·8 = 3·4 in.	10·5 = 4·1 in.	15 = 5·9 in.		17 = 6·7 in.	21 = 8·2 in.			24 = 9·4 in.	
Length of Bore . . . . cals.	40	40	40	45	40	40	45	50	40	
Length of Bore . . . . mm.	3520	4200	5965	6710	6905	8370	9420	10465	9600	
Total Length . . . . „	3750	4475	6355	7100	7355	8915	9965	11010	10225	
Weight of Gun . . . . kg.	1094	1555	4460	5020	6930	12330	13900	15450	18600	16750
Weight of Projectile . . „	9·5	16	46	46	70	125	125	125	190	190
Weight of Charge . . . „	2·66	5·05	14·4	16·6	22·4	39·9	45·8	52·3	60·1	51·8
Muzzle Velocity . . . . m.	840	840	840	890	840	840	890	940	840	800
Muzzle Energy . . mètre-tons	341·7	575	1654	1857	2517	4495	5047	5629	6833	6198
Muzzle Penetration (Steel) mm.	243	292	426	463	492	606	658	711	703	658

Calibre . . . . . cm.	28 = 11 in.						30·5 = 12 in.				38·1 = 15 in.	
Length of Bore . . . . cals.	40		45		50		45		50		45	
Length of Bore . . . . mm.	11200		12600		14000		13725		15250		17145	
Total Length . . . . „	11930		13330		14730		14520		16045		18135	
Weight of Gun . . . . kg.	29550	26600	33300	30200	37000	34050	43000	39000	47800	44000	83800	76100
Weight of Projectile . . „	300	300	300	300	300	300	390	390	390	390	760	760
Weight of Charge . . . „	95	82	110	95	125	111	142	123	162	143	277	241
Muzzle Velocity . . . . m.	840	800	890	850	940	900	890	850	940	900	890	850
Muzzle Energy . . mètre-tons	10790	9790	12110	11050	13510	12390	15750	14360	17560	16100	30680	27990
Muzzle Penetration (Steel). mm.	828	772	900	842	973	914	990	927	1071	1006	1257	1177

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Table Relating to Conversion of Measures.

Length.

Metric to English. | English to Metric.

I. Mètres.	II. Yards.	III. Feet.	IV. Inches.	V. Yards.	VI. Mètres.	VII. Feet.	VIII. Mètres.	IX. Inches.	X. Centimètres.
1	1·0936	3·2809	39·37	1	0·91438	1	0·30479	1	2·5400
2	2·1873	6·5618	78·74	2	1·82877	2	0·60959	2	5·0799
3	3·2809	9·8427	118·11	3	2·74315	3	0·91438	3	7·6199
4	4·3745	13·1236	157·48	4	3·65753	4	1·21918	4	10·1598
5	5·4682	16·4045	196·85	5	4·57192	5	1·52397	5	12·6998
6	6·5618	19·6854	236·22	6	5·48630	6	1·82877	6	15·2397
7	7·6554	22·9663	275·60	7	6·40068	7	2·13356	7	17·7797
8	8·7491	26·2472	314·97	8	7·31507	8	2·43836	8	20·3196
9	9·8427	29·5281	354·34	9	8·22945	9	2·74315	9	22·8596

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of yards in 2354 mètres (see cols. I. & II.).	of feet in 12·4 mètres (see cols. I. & III.).	of inches in 30·5 centimètres (see cols. I. & IV.). Note, 1 m.=100 cm.	of mètres in 1026 yards (see cols. V. & VI.).	of mètres in 1742 feet (see cols. VII. & VIII.).	of centimètres in 17·72 ins. (see cols. IX. & X.).
mètres. yards.	mètres. feet.	cms. inches.	yards. mètres.	feet. mètres.	inches. cms.
2000=2187·3	10 =32·809	30·0=11·811	1000=914·38	1000=304·79	10·0 =25·400
300= 328·09	2 = 6·562	·5= ·197	20= 18·29	700=213·36	7·0 =17·780
50= 54·68	0·4= 1·312		6= 5·49	40= 12·19	0·7 = 1·778
4= 4·37				2= 0·61	·02= ·051
∴ 2354=2574·44	∴ 12·4=40·683	∴ 30·5=12·008	∴ 1026=938·16	∴ 1742=530·95	∴ 17·72=45·009

Note.—A ready way of approximately converting all French measures into English inches is to multiply by 4 and apply the decimal point by common sense—Thus for a 15-cm. gun; 15 × 4 = 60. Now this Calibre cannot be 60 inches, nor can to be 0·6 inch; therefore it must be 6 inches. (The exact value is 5·906 in.)

Weight.

Metric to English. | English to Metric.

I. Kilogrammes.	II. Tons.	III. Pounds Avoirdupois.	IV. Grains Troy.	V. Tons.	VI. Milliers.	VII. Pounds Avoirdupois.	VIII. Kilogrammes.	IX. Grains. Troy.	X. Gramme
1	·000984	2·2046	15432·3	1	1·016	1	0·4536	1	·0648
2	·001968	4·4092	30864·7	2	2·032	2	0·9072	2	·1296
3	·002953	6·6139	46297·0	3	3·048	3	1·3608	3	·1944
4	·003937	8·8185	61729·4	4	4·064	4	1·8144	4	·2592
5	·004921	11·0231	77161·7	5	5·080	5	2·2680	5	·3240
6	·005905	13·2277	92594·1	6	6·096	6	2·7216	6	·3888
7	·006889	15·4323	108026·4	7	7·112	7	3·1751	7	·4536
8	·007874	17·6370	123458·8	8	8·128	8	3·6287	8	·5184
9	·008858	19·8416	138891·1	9	9·144	9	4·0823	9	·5832

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of tons in 35 milliers (see cols. I. & II. Note, 1000 kg. =1 millier).	of pounds in 56·3 kilogrammes. (see cols. I. & III.).	of grains in 120 grammes (see cols. I. & IV. Note, 1000 grms. = 1 kg.)	of milliers in 38 tons (see cols. V. & VI.).	of kilogrammes in 68 pounds (see cols. VII. & VIII).	of grammes in 85 grains (see cols. IX & X.).
milliers. tons.	kgrms. lbs.	grammes. grains.	tons. milliers.	lbs. kgs.	grains. grammes.
30 = 29·53	50 =110·231	100=1543·23	30 = 30·48	60 = 27·216	80 = 5·184
5 = 4·92	6 = 13·228	20= 308·65	8 = 8·13	8 = 3·629	5 = 0·324
	0·3= ·661				
∴ 35 = 34·45	∴ 56·3=124·120	∴ 120=1851·88	∴ 38 = 38·61	∴ 68 = 30·845	∴ 85 = 5·508

Note.—7000 grains troy = 1 pound avoirdupois.

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PRESSURE.

Metric to English.			English to Metric.				Atmospheric to English.		English to Atmospheric.	
I. Kilogrammes per square centimètre.	II. Pounds per square inch.	III. Tons per square inch.	IV. Pounds per square inch.	V. Kilogrammes per square centimètre.	VI. Tons per square inch.	VII. Kilogrammes per square centimètre.	VIII. Atmospheres.	IX. Tons per square inch.	X. Tons per square inch.	XI. Atmospheres.
1	14·223	·00635	1	·07031	1	157·49	1	·00656	1	152·38
2	28·446	·01279	2	·14062	2	314·99	2	·01313	2	304·76
3	42·668	·01905	3	·21003	3	472·48	3	·01969	3	457·14
4	56·891	·02540	4	·28124	4	629·97	4	·02625	4	609·52
5	71·114	·03175	5	·35155	5	787·47	5	·03281	5	761·91
6	85·337	·03810	6	·42186	6	944·96	6	·03938	6	914·29
7	99·560	·04445	7	·49217	7	1102·45	7	·04594	7	1066·67
8	113·783	·05080	8	·56248	8	1259·95	8	·05250	8	1219·05
9	128·005	·05715	9	·63279	9	1417·44	9	·05906	9	1371·43

Note.—One atmosphere is taken to be 14·7 lb. per square inch.

Explanation.—To convert any number from one measure to the other, take the value of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of pounds per square inch in 32·1 kilogrammes per square centimètre (see cols. I. & II.).		of tons per square inch in 3210 kilogrammes per square centimètre (see cols. I. & III.).		of kilogrammes per square centimètre in 15 lbs. per square inch (see cols. IV. & V.).		of kilogrammes per square centimètre in 18·3 tons per square inch (see cols. VI. & VII.).		of tons per square inch in 3254 atmospheres. (see cols. VIII. & IX.).		of atmosphere in 14·6 tons per square inch (see cols. X. & XI.).	
kgs. per sq. cm.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	kgs. per sq. cm.	atmospheres.	tons per sq. inch.	tons per sq. in.	atmospheres.
30 =	426·68	3000 =	19·05	10 =	·7031	10 =	1574·9	3000 =	19·69	10 =	1523·8
2 =	28·45	200 =	1·27	5 =	·3516	8 =	1259·95	200 =	1·31	4 =	609·5
0·1 =	1·42	10 =	·06			0·3 =	47·25	50 =	·33	0·6 =	91·4
∴ 32·1 =	456·55	∴ 3210 =	20·38	∴ 15 =	1·0547	∴ 18·3 =	2882·10	∴ 3254 =	21·36	∴ 14·6 =	2224·7

ENERGY.

Metric to English.		English to Metric.	
I. Mètre-tons.	II. Foot-tons.	III. Foot-tons.	IV. Mètre-tons.
1	3·2291	1	0·3097
2	6·4581	2	0·6194
3	9·6872	3	0·9291
4	12·9162	4	1·2388
5	16·1453	5	1·5484
6	19·3743	6	1·8581
7	22·6034	7	2·1678
8	25·8324	8	2·4775
9	29·0615	9	2·7872

1 mètre-ton is termed a "dinamo ie" in Italy.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus find the number

of foot-tons in 4367 mètre-tons (see cols. I. & II.).		of mètre-tons in 3592 foot-tons (see cols. III. & IV.).	
mètre-tons.	foot-tons.	foot-tons.	mètre-tons.
4000 =	12916·2	3000 =	929·1
300 =	968·72	500 =	154·84
60 =	193·74	90 =	27·87
7 =	22·60	2 =	·62
∴ 4367 =	14101·26	∴ 3592 =	1112·43

PERFORATION THROUGH IRON AND STEEL WITH THE FACE NOT HARDENED.

To obtain perforation through steel equivalent to a given perforation through iron, and *vice versa*.

1 inch steel = 1¼ inches iron;

that is, 4 inches steel = 5 inches iron.

Thus, given 9·4 inches perforation through iron

$$9{\cdot}4 \times \frac{4}{5} = 7{\cdot}52 \text{ inches steel;}$$

or, given 5·2 inches steel,

$$5{\cdot}2 \times \frac{5}{4} = 6{\cdot}5 \text{ inches iron}$$

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PART IV.

STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

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British Navy Estimates.

NAVY ESTIMATES FOR THE YEAR 1919–1920.

Votes.		Estimates 1919–1920.	Estimates 1914–1915.
	I.—Numbers.	Total Number.	Total Number.
A.	Total Number of Officers, Seamen, Boys, Coastguard, and Royal Marines	280,000	151,000
	II.—Effective Services.	£ (The figures are Net.)	£
1	Wages, etc., of Officers, Seamen and Boys, Coastguard, and Royal Marines	26,000,000	8,800,000
2	Victualling and Clothing for the Navy . . .	11,300,000	3,092,000
3	Medical Establishments and Services . . .	600,000	292,100
4	Civilians Employed on Fleet Services . . .	370,000	115,300
5	Educational Services	350,000	175,000
6	Scientific Services	400,000	64,700
7	Royal Naval Reserves	700,000	489,900
8	Shipbuilding, Repairs, Maintenance, etc.:		
	Section I.—*Personnel*	14,000,000	3,989,800
	Section II.—*Matériel*	16,500,000	7,087,400
	Section III.—Contract Work	37,500,000	14,287,800
9	Naval Armaments	18,000,000	5,544,300
10	Works, Buildings, and Repairs at Home and Abroad .	6,500,000	3,595,500
11	Miscellaneous Effective Services	3,500,000	523,700
12	Admiralty Office	1,360,000	483,500
	Total Effective Services . £	137,080,000	48,541,000
	III.—Non-Effective Services.		
13	Half-Pay and Retired Pay	1,022,000	1,003,700
14	Naval and Marine Pensions, Gratuities, and Compassionate Allowances	10,625,000	1,605,900
15	Civil Superannuation, Compensation Allowances, and Gratuities	473,000	399,400
	Total Non-Effective Services . £	12,120,000	3,009,000
	Grand Total . . £	149,200,000*	51,550,000

* Estimated requirements based on information at present available.

Admiralty,
March 5, 1919.

Walter H. Long.
R. E. Wemyss.
H. L. Heath.
C. M. de Bartolomé.
Hugh Tothill.
Sydney R. Fremantle.
A. L. Duff.
G. P. W. Hope.
Lytton.
Arthur F. Pease.

T. J. Macnamara,
Secretary.

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VOTE A.

Numbers.

Numbers of Officers, Seamen and Boys, Coastguard and Royal Marines, Borne on the Books of His Majesty's Ships and at the Royal Marine Divisions.

Two Hundred and Eighty Thousand **(280,000).**

VOTES 1 TO 15.

Effective and Non-Effective Services.

Vote on Account.

Sixty Million Pounds **(£60,000,000*).**

* Votes for the further amounts required for Navy Services during the year 1919-1920 will be submitted later in the Session.

VOTE A.

Numbers of Officers, Seamen and Boys, Coastguard, and Royal Marines, Borne on the Books of His Majesty's Ships and at the Royal Marine Divisions.

This Vote fixes the total number of Naval and Marine Officers, Men and Boys to be borne during the Year, excluding those who will be either in receipt of pay from non-effective Votes only or lent for service under Colonial or Foreign Governments, and Naval Officers who will be paid out of Shore Establishment (*e.g.*, Dockyard) Votes but will not be borne on Ships' Books.

The number voted represents a maximum which may not be exceeded, and in years immediately prior to the war was not reached until the end of the financial year. In 1919-1920, however, it is necessary to vote the maximum as an initial number; that is, the number, approximately, of the Officers, Men and Boys who, it is anticipated, will be serving on April 1, 1919. This number will be substantially reduced during the period of demobilisation. The rate of demobilisation and the number of the *personnel* for which it will be necessary to provide under peace conditions are dependent on circumstances which cannot yet be clearly foreseen.

VOTE 1.

Wages, etc., of Officers, Seamen and Boys, Coastguard and Royal Marines.

The provision under Vote 1 is primarily for the effective monetary emoluments of Naval and Marine Officers and Men as distinct from that for incidental services, *e.g.*, Victualling, and for non-effective emoluments, *i.e.*, half and retired pay and pensions (Votes 2, 13, and 14). In addition to this provision for "remuneration" the Vote contains items relating to contingent expenses connected with the Coastguard and Recruiting Stations and Marine Divisions.

The Officers and Men, and for part of the year women of the W.R.N.S., paid out of this Vote are all engaged upon Fleet Service or auxiliary duties not coming within the scope of those of Dockyards, Victualling Yards, Hospitals, etc. Their employment may be briefly described as follows:—

1. Service in the seagoing fleet.
2. Service in Stationary Ships or in Auxiliary Fleet Service appointments.
3. Service on the shore strength of the Royal Marines.
4. Service in the W.R.N.S.

Provision is also made under this Vote for the payment of children's allowances, separation and family allowances, etc.

VOTE 2.

Victualling and Clothing for the Navy.

Provides for the purchase of Victualling Stores and Clothing for the Fleet and for the maintenance of Victualling Yards at home and abroad, including Salaries and Allowances, Wages of Workmen and Police, Hire of Teams, and Rents, Water, Gas, etc., and Contingencies; also for the first cost, repair and maintenance of Victualling Yard Craft, and for the wages of their Crews.

The Rations, Clothing and Appointments of Royal Marines serving on Shore, and Marine Barrack Stores are also provided for in this Vote.

Under the heading Victualling Stores are included Provisions and Mess Traps for Officers and Men, Soap and Tobacco (issued on repayment), and Implements for H.M. Ships.

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The Vote also provides for Messing Allowances (supplementing rations issued in kind), and Allowances in lieu of Provisions and Clothing, and for the Freight and Lighterage of Victualling Stores.

VOTE 3.

Medical Establishments and Services.

This vote provides for the cost of maintaining Naval Hospitals and other Medica Establishments at home and abroad, for outlay on Medicines and Medical Stores for the Fleet, for expenditure in connection with the treatment of Officers and Men on shore by private practitioners, and for miscellaneous disbursements on medical services.

The expenses of Hospitals and Medical Establishments fall under the following heads:—Salaries and Allowances, Wages of Sick Berth Stewards and Attendants, and Hospital Servants, Wages of Police, Rents, Water, Lighting, etc., and Contingencies.

Medicines and Medical Stores comprise the provisions, stores, instruments and appliances required for Naval Hospitals and Royal Marine Infirmaries, etc., and for the Sick Bays of Ships.

VOTE 4.

Civilians Employed on Fleet Services.

This Vote is for the Salaries and Wages of Civilians engaged on duties which, though not purely Naval in character, would otherwise be performed by Naval ranks and ratings.

The expenses provided for include the following;—The Salaries of a Technical Expert in Wireless Telegraphy and his Assistants, Civilian Dental Surgeons at the Royal Naval Barracks, etc., and Nursing Sisters at Shotley Sick Quarters; and the Wages of working parties at the Royal Naval Barracks and Training Establishments and Schools, the crews of Ferry Steamers and Fleet Service Tugs, and men employed on miscellaneous services connected with the Fleet, in Chart Offices, and on Wireless Telegraphy and Torpedo duties, etc.

VOTE 5.

Educational Services.

Provides for expenses incurred in connection with the Education of the Fleet as distinguished from outlay on Training required for the Service afloat, and includes provision for the maintenance of the Royal Naval Colleges at Greenwich and Keyham, the Royal Naval Colleges for Cadets at Osborne and Dartmouth, and the Dockyard and Royal Marine Barrack Schools, and for the Educational Staff for the Fleet, etc.

The Estimate also includes provision for the expense of instruction at Cambridge University of young Naval Officers whose education in the Royal Naval Colleges was curtailed owing to the war.

Provision for Training, as apart from Education, is made under Vote 1 for Full Pay and Wages of instructors and crews of Training Ships, Vote 8 (Maintenance of Ships), &c.

VOTE 6.

Scientific Services.

This Vote provides for the cost of maintaining the Royal Observatory, Greenwich, and the Observatory at the Cape of Good Hope, for expenses in connection with the Photographic Mapping of the Heavens, for the Salaries and contingent expenses of the Hydrographic Department, the Compass Department and the Scientific Research and Experiment Department, for Coast and other Surveys, for the Naval Museum at the Royal Naval College, Greenwich, and the Nautical Almanac Office, for the purchase and repair of Chronometers and for annual grants to Scientific Institutions.

VOTE 7.

Royal Naval Reserves.

This Vote provides for the cost of all branches of the Naval Reserves, including the Royal Naval Reserve, the Royal Fleet Reserve, the Royal Naval Volunteers, the Reserve of Retired Officers, the Special Reserve of Royal Marine Officers, and the Auxiliary Royal Naval Sick Berth Reserve, and for Grants to Naval Units of Sea Cadet Corps.

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Provision for the pay of Reservists when called up for service in made under Vote 1.

Provision for Clothing, or allowances in lieu, required in connection with training is made under Vote 2.

VOTE 8.

Shipbuilding, Repairs, Maintenance, etc.

This Vote provides for the cost of building and repairing ships in H.M. Dockyards and by Contract, for Fuel and Sea Stores for the Fleet, and for the *personnel* of the Dockyards at home and abroad.

Sections I. and II. provide for Dockyard Work and Section III. for Contract Work.

Section I. (*Personnel*) includes the Salaries and Allowances of the Staff, the Wages of Workmen and Police, and contingent expenses of H.M. Dockyards.

Section II. (*Matériel*) provides for Naval Stores required for the maintenance of H.M. Ships, and materials required in the Dockyards for shipbuilding and repairs and Yard manufactures, for freight and other charges thereon, and for Rents, Water, Gas and Electric Current, etc.

Fuel, etc., for the Fleet is also provided for under Section II., including Coal, Oil Fuel, etc., and Lubricating Oils, together with freight and other charges thereon. Craft and Machinery for Coaling (first cost and maintenance), the Salaries of Coaling Officers, and the Wages of the crews of Coaling Craft.

Section III. (Contract Work) provides for the building and repair of Ships by contract, for Propelling and Auxiliary Machinery, Armour, and Gun Mountings required for ships building in H.M. Dockyards, for the Salaries and Wages of Officers and Workmen employed in the superintendence of Contract Work, and for Machinery for shore establishments generally, *i.e.*, Dockyards, Victualling Yards, Hospitals, etc.

VOTE 9.

Naval Armaments and Aviation.

This Vote provides for the cost of maintaining the Naval Ordnance and Torpedo Depôts and Factories at home and abroad, including Salaries and Allowances, the Wages of Workmen and Police, and Medical Attendance, Rent, Water, Gas, etc.: also for the first cost, maintenance, and repair of Naval Ordnance Vessels and the Wages of their Crews.

Provision is also made in this Vote for the cost of Naval Ordnance Stores—Guns, Projectiles and Ammunition, Torpedoes and Gun Cotton, Small Arms and Torpedo Material, etc.—for freight and other incidental charges thereon, and for Inspection, Proof and Experiments, including the Admiralty share of the expenses of the Ordnance Committee.

In addition, Aviation Services so far as these remain under the administration of the Admiralty are now provided for in this Vote. The provision is for the construction of Airships and the maintenance of Airships and Airship Stations and Store Depôt—including Salaries and Wages, Material, Rents, Water, Gas, Electric Lighting, etc.—and for Stores and Freight thereon.

VOTE 10.

Works, Buildings and Repairs at Home and Abroad.

This Vote provides for expenditure on Works, Buildings, Docks, and Repairs, at home and abroad, including the cost of superintendence, purchase of sites, grants in aid of works, and the annuity in repayment of advances authorised by the Naval Works Acts, 1895 to 1905, under which Acts expenditure to March 31, 1919, was incurred on the erection of buildings and docks and the purchase of sites, apart from the outlay provided for under Navy Votes.

Large new works are as a rule carried out by contract.

The cost of machinery and furniture required in connection with the equipment of buildings, etc., is provided for in Vote 8.

VOTE 11.

Miscellaneous Effective Services.

This Vote provides for expenditure on the following services:—

(*a*) Administrative services of so general a character as to render difficult a distribution of their cost over the various establishments and Store Votes,

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e.g., Telegraphic and Telephonic Services; Gratuities for Special Services rendered; Admiralty Committees; Advertisements, Newspapers, etc.; and Water Police employed in the patrol of waterways at the principal Naval Ports at home.

(*b*) Miscellaneous services relating to the *personnel* and *matériel* of the Fleet, *e.g.*, Travelling and Lodging Expenses of Officers and Men; Pilotage; Compensation for damage done by H.M. Ships; Compensation to Officers and Men for losses by Shipwreck, etc.; Assistance rendered to H.M. Ships in distress; Contributions to Religious, etc., Institutions; Allowances to Ministers of religion; Maintenance of Lighthouses and Lightships; Medals; and the expenses of Martial Law.

(*c*) Special Services, *e.g.*, Hire of Auxiliary Vessels for Service with the Fleet during Mobilisation, and Compensation for Total Loss of Vessels.

VOTE 12.

Admiralty Office.

This Vote contains provision for the Salaries and Wages of the *personnel* of the Admiralty Office, for Commission to Admiralty Shipping Agents and for Contingent Expenses.

Comprised therein are the Salaries of the Lords of the Admiralty and their Naval Assistants, and the Naval Staff, and the Salaries, Wages and Allowances of the Technical, Clerical and Messenger Staff generally.

Vote 12 includes provision for the civil pay of Civil Servants belonging to the Admiralty who are on military service.

VOTE 13.

Half-Pay and Retired Pay.

The provision under this Vote is mainly for the non-effective pay or gratuities granted to Commissioned Officers of the Royal Navy and Royal Marines (1) while still on the Active List but temporarily unemployed (half-pay); (2) on or after retirement from the Active List (retired pay or gratuity); and (3) on withdrawal or discharge from the Service (gratuity). The amounts payable under each of these heads are assessed under conditions varying with the rank and service of the several officers while on the Active List. Provision is also included to meet the annuities payable to the National Debt Commissioners on account of sums advanced to Officers commuting portions of their annual retired pay for immediate cash payments.

VOTE 14.

Naval and Marine Pensions, Gratuities and Compassionate Allowances.

In normal years the greater part of the provision under this Vote is for Pensions and Gratuities to Seamen and Marines. Provision is also made for pensions to Retired Naval Officers and to Engineers, Subordinate Officers, Warrant Officers, etc., Pensions for Good and Meritorious Services, Pensions and Gratuities for Conspicuous Bravery and for Wounds, Pensions to Widows of Naval and Marine Officers, Compassionate Allowances to Officers dismissed, etc., and charitable gratuities and Annual Allowances to Children of deceased Officers.

In 1919-1920 special provision in addition to the above is made for the payment of War Gratuities to Officers and Men of the Royal Navy and Royal Marines, including the Reserves.

VOTE 15.

Civil Superannuation, Compensation Allowances and Gratuities.

As the general description of this Vote implies, it bears the cost of Superannuation, Compensation allowances and Gratuities granted to Civil employés of the Admiralty. It also contains provision for Injury grants, and compensation to the dependants of Civil employés killed on duty, and for a contribution in aid of the Police Pension Fund in respect of Police employed on Admiralty service.

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BATTLE OF THE JUTLAND BANK.

THE following were the Despatches of Admiral Sir John Jellicoe, Commander-in-Chief, and Vice-Admiral Sir David Beatty on the battle of Jutland Bank, May 31–June 1, 1916.

Iron Duke, *June* 18, 1916.

SIR,—Be pleased to inform the Lords Commissioners of the Admiralty that the German High Sea Fleet was brought to action on the May 31, 1916, to the westward of the Jutland Bank, off the coast of Denmark.

2. The available ships of the Grand Fleet, in pursuance of the general policy of periodical sweeps through the North Sea, had left their bases on the previous day, in accordance with instructions issued by me.

3. The ships under my command taking part in the sweep were as follows:

[The list inserted in the despatch is omitted here. A full list of the ships engaged in the battle, British and German, showing the Fleet organisation, is printed in this volume following the despatch.]

4. In the early afternoon of Wednesday, May 31st, the First and Second Battle-cruiser Squadrons, First, Second and Third Light-cruiser Squadrons and destroyers from the First, Ninth and Thirteenth Flotillas, supported by the Fifth Battle Squadron, were, in accordance with my directions, scouting to the southward of the Battle Fleet, which was accompanied by the Third Battle-cruiser Squadron, First and Second Cruiser Squadrons, Fourth Light-cruiser Squadron, Fourth, Eleventh and Twelfth Flotillas.

Sir David Beatty's action.

5. The junction of the Battle Fleet with the scouting force after the enemy had been sighted was delayed owing to the southerly course steered by the latter during the first hour of their action with the enemy battle-cruisers. This was, of course, unavoidable, as had our battle-cruisers not followed the enemy to the southward the main Fleets would never have been in contact.

The Battle-cruiser Fleet, gallantly led by Vice-Admiral Sir David Beatty, and admirably supported by the ships of the Fifth Battle Squadron, under Rear-Admiral Evan-Thomas, fought an action under, at times, disadvantageous conditions, in a manner that was in keeping with the best traditions of the Service. Our vessels had a considerable advantage in gun-power and in numbers prior to the arrival of the German Battle Fleet, but the great disparity between British and German battle cruisers in the matter of protection must not be forgotten. The German vessels are in this respect equal to powerful battleships, whereas our battle cruisers, particularly those of the Second and Third Battle-cruiser Squadrons, are very lightly protected. The main difficulty with which our ships had to contend was the bad light. All reports mention the difficulty experienced in sighting the enemy vessels to the eastward, whilst remarking on the clearness of the western horizon. A photograph taken from Malaya during the action indicates this fact very clearly.

During the period that the Fifth Battle Squadron was engaged with the enemy leading battleships as well as battle-cruisers, all the advantages of light and numbers were on the side of the enemy, and the punishment inflicted by our ships is testimony to the fighting qualities of the *personnel*.

6. The following extracts from the report of Vice-Admiral Sir David Beatty give the course of events before the Battle Fleet came upon the scene:—

2.20 p.m. Enemy vessels reported.

"At 2.20 p.m. reports were received from Galatea indicating the presence of enemy vessels. The direction of advance was immediately altered to S.S.E., the course for Horn Reef, so as to place my force between the enemy and his base.

"At 2.35 p.m. a considerable amount of smoke was sighted to the eastward. This made it clear that the enemy was to the northward and eastward, and that it would be impossible for him to round the Horn Reef without being brought to action. Course was accordingly altered eastward and north-eastward, the enemy being sighted at 3.31 p.m. They appeared to be five battle-cruisers.

"After the first report of the enemy, the First and Third Light-cruiser Squadrons changed their direction, and, without waiting for orders, spread to

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the east, thereby forming a screen in advance of the Battle-cruiser Squadrons and Fifth Battle Squadron by the time we had hauled up to the course of approach. They engaged enemy light cruisers at long range. In the meantime the Second Light-cruiser Squadron had come in at high speed and was able to take station ahead of the battle cruisers by the time we turned E.S.E., the course on which we first engaged the enemy. In this respect the work of the Light-cruiser Squadrons was excellent and of great value.

Reports of Galatea and seaplane.

"From a report from Galatea at 2.25 p.m. it was evident that the enemy force was considerable, and not merely an isolated unit of light cruisers, so at 2.45 p.m. I ordered Engadine to send up a seaplane and scout to N.N.E. This order was carried out very quickly, and by 3.8 p.m. a seaplane, with Flight Lieutenant F. J. Rutland, R.N., as pilot, and Assistant Paymaster G. S. Trewin, R.N., as observer, was well under way; her first reports of the enemy were received in Engadine about 3.30 p.m. Owing to clouds it was necessary to fly very low, and in order to identify four enemy light cruisers the seaplane had to fly at a height of 900 feet within 3000 yards of them, the light cruisers opening fire on her with every gun that would bear. This in no way interfered with the clarity of their reports, and both Flight-Lieutenant Rutland and Assistant Paymaster Trewin are to be congratulated on their achievement, which indicates that seaplanes under such circumstances are of distinct value.

Line of battle formed.

"At 3.30 p.m. I increased speed to 25 knots, and formed line of battle, the Second Battle-cruiser Squadron forming astern of the First Battle-cruiser Squadron, with destroyers of the Thirteenth and Ninth Flotillas taking station ahead. I turned to E.S.E., slightly converging on the enemy, who were now at a range of 23,000 yards, and formed the ships on a line of bearing to clear the smoke. The Fifth Battle Squadron, who had conformed to our movements, were now bearing N.N.W., 10,000 yards. The visibility at this time was good, the sun behind us, and the wind S.E. Being between the enemy and his base, our situation was tactically and strategically good.

Fire opened 3.48 p.m.

"At 3.48 p.m. the action commenced at a range of 18,500 yards, both forces opening fire practically simultaneously. Course was altered to the southward, and subsequently the mean direction was S.S.E., the enemy steering a parallel course distant about 18,000 to 14,500 yards.

"Shortly after 4 p.m. Indefatigable, after a violent explosion, fell out of the line, turned over and sank.

Fifth Battle Squadron.

"At 4.8 p.m. the Fifth Battle Squadron came into action and opened fire at a range of 20,000 yards. The enemy's fire now seemed to slacken. The destroyer Landrail, of Ninth Flotilla, who was on our port beam, trying to take station ahead, sighted the periscope of a submarine on her port quarter. Though causing considerable inconvenience from smoke, the presence of Lydiard and Landrail undoubtedly preserved the battle cruisers from closer submarine attack. Nottingham also reported a submarine on the starboard beam.

Destroyer action, beginning 4.15 p.m.

"Eight destroyers of the Thirteenth Flotilla, Nestor, Nomad, Nicator, Narborough, Pelican, Petard, Obdurate, Nerissa, with Moorsom and Morris of Tenth Flotilla, Turbulent and Termagant of the Ninth Flotilla, having been ordered to attack the enemy with torpedoes when opportunity offered, moved out at 4.15 p.m., simultaneously with a similar movement on the part of the enemy. The attack was carried out in the most gallant manner, and with great determination. Before arriving at a favourable position to fire torpedoes, they intercepted an enemy force consisting of a light cruiser and fifteen destroyers. A fierce engagement ensued at close quarters, with the result that the enemy were forced to retire on their battle-cruisers, having lost two destroyers sunk, and having their torpedo attack frustrated. Our destroyers sustained no loss in this engagement, but their attack on the enemy battleships was rendered less effective, owing to some of the destroyers having dropped astern during the fight. Their position was therefore unfavourable for torpedo attack.

"Nestor, Nomad, and Nicator, gallantly led by Commander the Hon. Edward B. S. Bingham, of Nestor, pressed home their attack on the battle-cruisers and fired two torpedoes at them at a range of 6000 and 5000 yards, being subjected to a heavy fire from the enemy's secondary armament. Nomad was badly hit, and apparently remained stopped between the lines. Subsequently Nestor and Nicator altered course to the S.E., and in a short time the opposing battle-cruisers, having turned sixteen points, found themselves within close range of a number of enemy battleships. Nothing daunted, though under a terrific fire, they stood on, and their position being favourable for torpedo attack fired a torpedo at the second ship of the enemy line at a range of 3000 yards. Before they could fire their fourth torpedo Nestor was badly hit and swung to starboard, Nicator altering course inside her to avoid collision, and thereby being

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prevented from firing the last torpedo. Nicator made good her escape, and subsequently rejoined the Captain (D), Thirteenth Flotilla Nestor remained stopped, but was afloat when last seen. Moorsom also carried out an attack on the enemy's Battle Fleet.

"Petard, Nerissa, Turbulent, and Termagant also pressed home their attack on the enemy battle-cruisers, firing torpedoes after the engagement with enemy destroyers. Petard reports that all her torpedoes must have crossed the enemy's line, while Nerissa states that one torpedo appeared to strike the rear ship. These destroyer attacks were indicative of the spirit pervading His Majesty's Navy, and were worthy of its highest traditions.

Battle-cruiser action.

"From 4.15 to 4.43 p.m. the conflict between the opposing battle-cruisers was of a very fierce and resolute character. The Fifth Battle Squadron was engaging the enemy's rear ships, unfortunately at very long range. Our fire began to tell, the accuracy and rapidity of that of the enemy depreciating considerably. At 4.18 p.m. the third enemy ship was seen to be on fire. The visibility to the north-eastward had become considerably reduced, and the outline of the ships very indistinct.

"At 4.26 p.m. there was a violent explosion in Queen Mary; she was enveloped in clouds of grey smoke, and disappeared. Eighteen of her officers and men were subsequently picked up by Laurel.

Enemy Battle Fleet reported. Course changed to northward.

"At 4.38 p.m. Southampton reported the enemy's Battle Fleet ahead. The destroyers were recalled, and at 4.42 p.m. the enemy's Battle Fleet was sighted S.E. Course was altered sixteen points in succession to starboard, and I proceeded on a northerly course to lead them towards the Grand Fleet. The enemy battle-cruisers altered course shortly afterwards, and the action continued. Southampton, with the Second Light-cruiser Squadron, held on to the southward to observe. They closed to within 13,000 yards of the enemy Battle Fleet, and came under a very heavy but ineffective fire. Southampton's reports were most valuable. The Fifth Battle Squadron were now closing on an opposite course and engaging the enemy battle-cruisers with all guns. The position of the enemy Battle Fleet was communicated to them, and I ordered them to alter course sixteen points. Led by Rear-Admiral Hugh Evan-Thomas, M.V.O., in Barham, this squadron supported us brilliantly and effectively.

Fifth Battle Squadron takes station astern.

"At 4.57 p.m. the Fifth Battle Squadron turned up astern of me and came under the fire of the leading ships of the enemy Battle Fleet. Fearless, with the destroyers of First Flotilla, joined the battle-cruisers, and, when speed admitted, took station ahead. Champion, with Thirteenth Flotilla, took station on the Fifth Battle Squadron. At 5 p.m. the First and Third Light-cruiser Squadrons, which had been following me on the southerly course, took station on my starboard bow; the Second Light-cruiser Squadron took station on my port quarter.

Enemy van turned 6 p.m. Effective fire.

"The weather conditions now became unfavourable, our ships being silhouetted against a clear horizon to the westward, while the enemy were for the most part obscured by mist, only showing up clearly at intervals. These conditions prevailed until we had turned their van at about 6 p.m. Between 5 and 6 p.m. the action continued on a northerly course, the range being about 14,000 yards. During this time the enemy received very severe punishment, and, undoubtedly, one of their battle-cruisers quitted the line in a considerably damaged condition. This came under my personal observation, and was corroborated by Princess Royal and Tiger. Other enemy ships also showed signs of increasing injury. At 5.5 p.m. Onslow and Moresby, who had been detached to assist Engadine with the seaplane, rejoined the battle-cruiser squadrons and took station on the starboard (engaged) bow of Lion. At 5.10 p.m. Moresby, being two points before the beam of the leading enemy ship, fired a torpedo at the third in their line. Eight minutes later she observed a hit with a torpedo on what was judged to be the sixth ship in the line. Moresby then passed between the lines to clear the range of smoke, and rejoined Champion. In corroboration of this, Fearless reports having seen an enemy heavy ship heavily on fire at about 5.10 p.m., and shortly afterwards a huge cloud of smoke and steam, similar to that which accompanied the blowing up of Queen Mary and Indefatigable.

"At 5.35 p.m. our course was N.N.E., and the estimated position of the Grand Fleet was N. 16 W., so we gradually hauled to the north-eastward, keeping the range of the enemy at 14,000 yards. He was gradually hauling to the eastward, receiving severe punishment at the head of his line, and probably acting on information received from his light cruisers which had sighted and were engaged with the Third Battle-cruiser Squadron (*vide* Indomitable's report). Possibly Zeppelins were present also. At 5.50 p.m. British cruisers were sighted

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on the port bow, and at 5.56 p.m. the leading battleships of the Grand Fleet bearing north 5 miles. I thereupon altered course to east and proceeded at utmost speed. This brought the range of the enemy down to 12,000 yards. I made a report to the Commander-in-Chief that the enemy battle-cruisers bore south-east. At this time only three of the enemy battle-cruisers were visible, closely followed by battleships of the König class. British Battle Fleet sighted.

"At about 6.5 p.m. Onslow, being on the engaged bow of Lion, sighted an enemy light cruiser at a distance of 6000 yards from us, apparently endeavouring to attack with torpedoes. Onslow at once closed and engaged her, firing fifty-eight rounds at a range of from 4000 to 2000 yards, scoring a number of hits. Onslow then closed the enemy battle-cruisers, and orders were given for all torpedoes to be fired. At this moment she was struck amidships by a heavy shell, with the result that only one torpedo was fired. Thinking that all his torpedoes had gone, the commanding officer proceeded to retire at slow speed. Being informed that he still had three torpedoes, he closed the light cruiser previously engaged and torpedoed her. The enemy's Battle Fleet was then sighted, and the remaining torpedoes were fired at them and must have crossed the enemy's track. Damage then caused Onslow to stop. Onslow's fight.

"At 7.15 p.m. Defender, whose speed had been reduced to 10 knots, while on the disengaged side of the battle-cruisers, by a shell which damaged her foremost boiler, closed Onslow and took her in tow. Shell were falling all round them during this operation, which, however, was successfully accomplished. During the heavy weather of the ensuing night the tow parted twice, but was re-secured. The two struggled on together until 1 p.m., June 1st, when Onslow was transferred to tugs. I consider the performances of these two destroyers to be gallant in the extreme, and I am recommending Lieut.-Commander J. C. Tovey, of Onslow, and Lieut.-Commander Palmer, of Defender, for special recognition. Onslow was possibly the destroyer referred to by the Rear-Admiral Commanding Third Light-cruiser Squadron as follows:—

"'Here I should like to bring to your notice the action of a destroyer (name unknown) which we passed close in a disabled condition soon after 6 p.m. She apparently was able to struggle ahead again, and made straight for the Derfflinger to attack her. The incident appeared so courageous that it seems desirable to investigate it further.'"

Proceedings of Battle Fleet.

7. On receipt of the information that the enemy had been sighted, the British Battle Fleet, with its accompanying cruiser and destroyer force, proceeded at full speed on a S.-E. by S. course to close the Battle-cruiser Fleet. During the two hours that elapsed before the arrival of the Battle Fleet on the scene the steaming qualities of the older battleships were severely tested. Great credit is due to the engine-room departments for the manner in which they, as always, responded to the call, the whole Fleet maintaining a speed in excess of the trial speeds of some of the older vessels.

The Third Battle-cruiser Squadron, commanded by Rear-Admiral the Hon. Horace L. A. Hood, which was in advance of the Battle-Fleet, was ordered to reinforce Sir David Beatty. The difference in reckoning between Lion and the Iron Duke, which was inevitable under the circumstances existing, apparently caused the Third Battle-cruiser Squadron to press rather too far to the eastward, and it was not until 5.30 p.m. that this squadron observed flashes of gunfire and heard the sound of guns to the south-westward. Rear-Admiral Hood sent the Chester (Captain Robert N. Lawson) to investigate, and this ship engaged three or four enemy light cruisers at about 5.45 p.m. The engagement lasted for about twenty minutes, during which period Captain Lawson handled his vessel with great skill against heavy odds, and, although the ship suffered considerably in casualties, her fighting and steaming qualities were unimpaired, and at about 6.5 p.m. she rejoined the Third Battle-cruiser Squadron. Third Battle-cruiser Squadron joins Beatty.

The Third Battle-cruiser Squadron had turned to the north-westward, and at 6.10 p.m. sighted our battle-cruisers, the squadron taking station ahead of the Lion at 6.21 p.m. in accordance with the orders of the Vice-Admiral Commanding the Battle-cruiser Fleet. He reports as follows:—

"I ordered them to take station ahead, which was carried out magnificently, Rear-Admiral Hood bringing his squadron into action ahead in a most inspiring manner, worthy of his great naval ancestors. At 6.25 p.m. I altered course to the E.S.E. in support of the Third Battle-cruiser Squadron, who were at this time only 8000 yards from the enemy's leading ship. They were pouring a hot fire into her and caused her to turn to the westward of south. At the same time

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I made a visual report to the Commander-in-Chief of the bearing and distance of the enemy Battle Fleet. At 6.33 p.m. Invincible blew up.

Damage to enemy ships.

"After the loss of Invincible, the squadron was led by Inflexible until 6.50 p.m. By this time the battle-cruisers were clear of our leading battle-squadron, then bearing about N.N.W. 3 miles, and I ordered the Third Battle-cruiser Squadron to prolong the line astern and reduced to 18 knots. The visibility at this time was very indifferent, not more than 4 miles, and the enemy ships were temporarily lost sight of. It is interesting to note that, after 6 p.m., although the visibility became reduced, it was undoubtedly more favourable to us than to the enemy. At intervals their ships showed up clearly, enabling us to punish them very severely and establish a definite superiority over them. The damage received by our ships during this period, excepting destruction of Invincible, was slight. From the report of other ships and my own observation it was clear that the enemy suffered severely, battle-cruisers and battleships alike. The head of their line was crumpled up, leaving battleships as targets for the majority of our battle-cruisers. Before leaving us the Fifth Battle Squadron was also engaging battleships. The report of Rear-Admiral Evan-Thomas shows that excellent results were obtained, and it can be safely said that his magnificent squadron wrought great execution.

"From the report of Rear-Admiral T. D. W. Napier, M.V.O., the Third Light-cruiser Squadron, which had maintained its station on our starboard bow well ahead of the enemy, at 6.25 p.m. attacked with the torpedo. Falmouth and Yarmouth both fired torpedoes at the leading enemy battle-cruiser, and it is believed that one torpedo hit, as a heavy under-water explosion was observed. The Third Light-cruiser Squadron then gallantly attacked the heavy ships with gunfire, with impunity to themselves, thereby demonstrating that the fighting efficiency of the enemy had been seriously impaired. Rear-Admiral Napier deserves great credit for his determined and effective attack. Indomitable reports that about this time one of the Derfflinger class fell out of the enemy's line."

Approach of Commander-in-Chief.

8. Meanwhile, at 6 p.m. Canterbury (Captain Percy M. R. Royds), had engaged enemy light cruisers which were firing heavily on the torpedo-boat destroyer Shark (Commander Loftus W. Jones), Acasta (Lieut.-Commander John O. Barron), and Christopher (Lieut.-Commander Fairfax M. Kerr); as a result of this engagement the Shark was sunk.

9. At 5.45 p.m. the report of guns had become audible to me, and at 5.55 p.m. flashes were visible from ahead round to the starboard beam, although in the mist no ships could be distinguished, and the position of the enemy's Battle Fleet could not be determined. The difference in reckoning between Iron Duke and Lion, mentioned in paragraph 6 added to the uncertainty of the general situation.

10. Shortly after 5.55 p.m. some of the cruisers ahead, under Rear-Admirals Herbert L. Heath, and Sir Robert Arbuthnot, Bart., were seen to be in action, and reports received show that Defence, flagship (Captain Stanley V. Ellis), and Warrior (Captain Vincent B. Molteno), of the First-cruiser Squadron, engaged an enemy light cruiser at this time, which subsequently sank.

11. At 6 p.m. vessels, afterwards seen to be our battle-cruisers, were sighted by Marlborough bearing before the starboard beam of the Battle Fleet.

At the same time the Vice-Admiral Commanding, Battle-cruiser Fleet reported to me the position of the enemy battle-cruisers, and at 6.14 p.m. reported the position of the enemy Battle Fleet.

At this period, when the Battle Fleet was meeting the battle cruisers and the Fifth Battle Squadron, great care was necessary to ensure that our own ships were not mistaken for enemy vessels.

12. I formed the battle fleet in line of battle on receipt of Sir David Beatty's report, and during deployment the fleets became engaged. Sir David Beatty had meanwhile formed the battle-cruisers ahead of the Battle Fleet.

The divisions of the Battle Fleet were led by:—

The Commander-in-Chief.
Vice-Admiral Sir Cecil Burney.
Vice-Admiral Sir Thomas Jerram.
Vice-Admiral Sir Doveton Sturdee.
Rear-Admiral Alexander L. Duff.
Rear-Admiral Arthur C. Leveson.
Rear-Admiral Ernest F. A. Gaunt.

13. At 6.16 p.m. Defence and Warrior were observed passing down between the British and German Battle Fleets under a very heavy fire. Defence was seen to blow up and Warrior passed to the rear disabled. It is probable that Sir Robert Arbuthnot, during his engagement with the enemy's light cruisers, and in his desire to complete

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their destruction, was not aware of the approach of the enemy's heavy ships, owing to the mist, until he found himself in close proximity to the main fleet, and before he could withdraw his ships they were caught under a heavy fire and disabled. It is not known when Black Prince (Captain Thomas P. Bonham), of the same squadron, was sunk, but as a wireless signal was received from her between 8 and 9 p.m. reporting the position of a submarine, it is possible that her loss was the result of a torpedo attack. There is much strong evidence of the presence of a large number of enemy submarines in the vicinity of the scene of the action. Sir R. Arbuthnot's action.

14. The First Battle Squadron, which was in the rear on deployment, became engaged during deployment, the Vice-Admiral opening fire at 6.17 p.m. on a battleship of the Kaiser class. The centre squadron, which had previously been firing at an enemy light cruiser, opened fire at 6.30 p.m. on a battleship of the König class, and the van squadron commenced immediately afterwards.

At 6.6 p.m. the Rear-Admiral Commanding Fifth Battle Squadron, then in company with the battle-cruisers, had sighted the starboard wing division of the Battle Fleet on the port bow of Barham, and the first intention of Rear-Admiral Evan-Thomas was to form ahead of the remainder of the Battle Fleet, but on realising the direction of deployment he was compelled to form astern, a manœuvre which was well executed by the squadron under a heavy fire from the enemy Battle Fleet. An accident to Warspite's steering gear caused her helm to become jammed temporarily and took the ship in the direction of the enemy's line, during which time she was hit several times. Clever handling enabled Captain Phillpotts to extricate his ship from a somewhat awkward situation. Movements of Battle Squadrons.

Owing principally to the mist, but partly to the smoke, it was possible to see only a few ships at a time in the enemy's battle line. Towards the van only some four or five ships were ever visible at once. More could be seen from the rear squadron, but never more than eight to twelve.

The action between the battle-fleets lasted intermittently from 6.17 p.m. to 8.20 p.m. at ranges between 9000 and 12,000 yards, during which time the British Fleet made alterations of course from S.E. by E. to W. in the endeavour to close. The enemy constantly turned away and opened the range under cover of destroyer attacks and smoke screens as the effect of the British fire was felt, and the alterations of course had the effect of bringing the British Fleet (which commenced the action in a position of advantage on the bow of the enemy) to a quarterly bearing from the enemy battle line, but at the same time placed us between the enemy and his bases. Ranges of battle action.

At 6.55 p.m. Iron Duke passed the wreck of Invincible with Badger standing by. I was not aware of the loss of Queen Mary and Indefatigable until the following day.

15. During the somewhat brief periods that the ships of the High Sea Fleet were visible through the mist, the heavy and effective fire kept up by the battleships and battle-cruisers of the Grand Fleet caused me much satisfaction, and the enemy vessels were seen to be constantly hit, some being seen to haul out of the line and at least one to sink. The enemy's return fire at this period was not effective, and the damage caused to our ships was insignificant.

The Battle-cruisers in the Van.

16. Sir David Beatty reports:—

"Between 7 and 7.12 p.m. we hauled round gradually to S.W. by S. to regain touch with the enemy, and at 7.14 p.m. again sighted them at a range of about 15,000 yards. The ships sighted at this time were two battle-cruisers and two battleships, apparently of the König class. No doubt more continued the line to the northward, but that was all that could be seen. The visibility having improved considerably as the sun descended below the clouds, we re-engaged at 7.17 p.m. and increased speed to 22 knots. At 7.32 p.m. my course was S.W., speed 18 knots, the leading enemy battleship bearing N.W. by W. Again, after a very short time, the enemy showed signs of punishment, one ship being on fire, while another appeared to drop right astern. The destroyers at the head of the enemy's line emitted volumes of grey smoke, covering their capital ships as with a pall, under cover of which they undoubtedly turned away, and at 7.45 p.m. we lost sight of them. Conditions of visibility.

"At 7.58 p.m. I ordered the First and Third Light-cruiser Squadrons to sweep to the westward and locate the head of the enemy's line, and at 8.20 p.m. we altered course to west in support. We soon located two battle-cruisers and battleships, and more heavily engaged at a short range of about 10,000 yards. The leading ship was hit repeatedly by Lion, and turned away eight points, emitting very high flames and with a heavy list to port. Princess Royal set fire to a three-funnelled battleship. New Zealand and Indomitable report that the third ship, which they both engaged, hauled out of the line, heeling over and on Pursuit of the enemy.

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fire. The mist which now came down enveloped them, and Falmouth reported they were last seen at 8.38 p.m. steaming to the westward.

"At 8.40 p.m. all our battle-cruisers felt a heavy shock as if struck by a mine or torpedo, or possibly sunken wreckage. As, however, examination of the bottoms reveals no sign of such an occurrence, it is assumed that it indicated the blowing up of a great vessel. This seems a very probable explanation in view of the condition in which the enemy was last seen."

Sir John Jellicoe on Battle Fleet action.

17. As was anticipated, the German Fleet appeared to rely very much on torpedo attacks, which were favoured by the low visibility and by the fact that we had arrived in the position of a "following" or "chasing" fleet. A large number of torpedoes were apparently fired, but only one took effect (on Marlborough), and even in this case the ship was able to remain in the line and to continue the action. The menace of effective torpedo attack on a long line, however, in weather conditions, which were ideal for the purpose, contributed to the difficulty of keeping within effective range of the enemy. Two separate destroyer attacks were made by the enemy.

Details of Battle Fleet Action.

First Battle Squadron.

18. The First Battle Squadron, under Vice-Admiral Sir Cecil Burney, came into action at 6.15 p.m. with the enemy's Third Battle Squadron, at a range of about 11,000 yards, and administered severe punishment, both to the battleships and to the battle-cruisers and light cruisers, which were also engaged. The fire of Marlborough (Captain George P. Ross) was particularly rapid and effective. This ship commenced at 6.17 p.m. by firing seven salvoes at a ship of the Kaiser class, then engaged a cruiser, and again a battleship, and at 6.54 she was hit by a torpedo and took up a considerable list to starboard, but reopened at 7.3 p.m. at a cruiser, and at 7.12 p.m. fired fourteen rapid salvoes at a ship of the König class, hitting her frequently until she turned out of the line. The manner in which this effective fire was kept up, in spite of the disadvantages due to the injury caused by the torpedo, was most creditable to the ship and a very fine example to the squadron.

The range decreased during the course of the action to 9000 yards. The First Battle Squadron received more of the enemy's return fire than the remainder of the Battle Fleet, with the exception of the Fifth Battle Squadron. Colossus was hit, but was not seriously damaged, and other ships were straddled with fair frequency.

Fourth Battle Squadron.

In the Fourth Battle Squadron—in which squadron my flagship, Iron Duke, was placed—Vice-Admiral Sir Doveton Sturdee leading one of the divisions, the enemy engaged was the third squadron and some of the battle-cruisers, as well as disabled cruisers and light cruisers. The mist rendered range-taking a difficult matter, but the fire of the squadron was effective. Iron Duke having previously fired at a light cruiser between the lines, opened fire at 6.30 p.m. on a battleship of the König class at a range of 12,000 yards. The latter was very quickly straddled, and hitting commenced at the second salvo and only ceased when the target ship turned away. The rapidity with which hitting was established was most creditable to the excellent gunnery organisation of the flagship, so ably commanded by my Flag Captain, Captain Frederic C. Dreyer.

The fire of other ships of the squadron was principally directed at enemy battle-cruisers and cruisers as they appeared out of the mist. Hits were observed to take effect on several ships.

Second Battle Squadron.

The ships of the Second Battle Squadron, under Vice-Admiral Sir Thomas Jerram, were in action with vessels of the Kaiser or König classes between 6.30 and 7.20 p.m., and fired also at an enemy battle-cruiser which had apparently dropped back severely damaged.

19. During the action between the Battle Fleets the Second Cruiser Squadron, ably commanded by Rear-Admiral Herbert L. Heath, with the addition of Duke of Edinburgh of the First Cruiser Squadron, occupied a position at the van of the Battle Fleet and acted as a connecting link between the Battle Fleet and the Battle-cruiser Fleet. This squadron, although it carried out useful work, did not have an opportunity of coming into action.

The attached cruisers Boadicea, Active, Blanche, and Bellona carried out their duties as repeating-ships with remarkable rapidity and accuracy under difficult conditions.

Cruiser Squadrons.

The Fourth Light-cruiser Squadron, under Commodore Charles E. Le Mesurier, occupied a position in the van until ordered to attack enemy destroyers at 7.20 p.m., and again at 8.18 p.m., when they supported the Eleventh Flotilla, which had moved out under Commodore James R. P. Hawksley to attack. On each occasion the Fourth Light-cruiser Squadron was very well handled by Commodore Le Mesurire, his captains giving him excellent support, and their object was attained, although with some loss in the second attack, when the ships came under the heavy fire of the

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enemy Battle Fleet at between 6500 and 8000 yards. The Calliope was hit several times, but did not sustain serious damage, although, I regret to say, she had several casualties. The light cruisers attacked the enemy's battleships with torpedoes at this time, but were not able to observe the result; an explosion on board a ship of the Kaiser class was seen, however, at 8.38 p m.

During these destroyer attacks four enemy torpedo-boat destroyers were sunk by the gunfire of battleships, light cruisers, and destroyers.

Night Dispositions.

20. At 9 p.m. the enemy was entirely out of sight, and the threat of torpedo-boat destroyer attacks during the rapidly approaching darkness made it necessary for me to dispose the fleet for the night, with a view to its safety from such attacks, whilst providing for a renewal of action at daylight. I accordingly manœuvred to remain between the enemy and his bases, placing our flotillas in a position in which they would afford protection to the fleet from destroyer attack, and at the same time be favourably situated for attacking the enemy's heavy ships.

Night Attacks by Flotillas.

21. During the night the British heavy ships were not attacked, but the Fourth, Eleventh, and Twelfth Flotillas, under Commodore Hawksley, and Captains Wintour and Stirling, delivered a series of very gallant and successful attacks on the enemy, causing him heavy losses. Flotilla night action.

22. It was during these attacks that severe losses in the Fourth Flotilla occurred, including that of Tipperary, with the gallant leader of the flotilla, Captain Wintour. He had brought his flotilla to a high pitch of perfection, and although suffering severely from the fire of the enemy, a heavy toll of enemy vessels was taken, and many gallant actions were performed by the flotilla.

Two torpedoes were seen to take effect on enemy vessels as the result of the attacks of the Fourth Flotilla, one being from Spitfire (Lieutenant-Commander Clarence W. E. Trelawny), and the other from either Ardent (Lieutenant-Commander Arthur Marsden), Ambuscade (Lieutenant-Commander Gordon A. Coles) or Garland (Lieutenant-Commander Reginald S. Goff).

23. The attack carried out by the Twelfth Flotilla (Captain Anselan J. B. Stirling) was admirably executed. The squadron attacked, which consisted of six large vessels, besides light cruisers, and comprised vessels of the Kaiser class, and were almost completely surprised. A large number of torpedoes was fired, including some at the second and third ships in the line; those fired at the third ship took effect, and she was observed to blow up. A second attack, made twenty minutes later, by Maenad (Commander John P. Champion) on the five vessels still remaining resulted in the second ship in the line being also hit and blown up.

The destroyers were under a heavy fire from the light cruisers on reaching the rear of the line, but Onslaught was the only vessel which received any material injuries. In Onslaught, Sub-Lieutenant Harry W. A. Kemmis, assisted by Midshipman Reginald G. Arnot, R.N.R., the only executive officers not disabled, brought the ship successfully out of action and reached Rosyth.

24. During the attack carried out by the Eleventh Flotilla, Castor (Commodore James R. P. Hawksley) leading, the flotilla engaged and sank an enemy torpedo-boat destroyer at point blank range.

The Thirteenth Flotilla, under the command of Captain James U. Farie, in Champion, took station astern of the Battle Fleet for the night. At 0.30 a.m. on Thursday, June 1st, a large vessel crossed the rear of the flotilla at high speed. She passed close to the Petard and Turbulent, switched on searchlights, and opened a heavy fire, which severely damaged Petard and disabled Turbulent. At 3.30 a.m. Champion was engaged for a few minutes with four enemy destroyers. Moresby reports four ships of Deutschland class sighted at 2.35 a.m., at whom she fired one torpedo. Two minutes later an explosion was felt by Moresby and Obdurate.

Abdiel, ably commanded by Commander Berwick Curtis, carried out her duties with the success which has always characterised her work.

There were many gallant deeds performed by the destroyer flotillas; they surpassed the very highest expectations that I had formed of them.

Apart from the proceedings of the flotillas, the Second Light-cruiser Squadron, in the rear of the Battle Fleet, was in close action for about fifteen minutes at 10.20 p.m. with a squadron comprising one enemy cruiser and four light cruisers, during which period Southampton and Dublin (Captain Albert C. Scott) suffered rather heavy casualties, although their steaming and fighting qualities were not impaired. It is reasonable to suppose that they inflicted considerable damage on their opponents.

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Proceedings on June 1st.

Situation at daylight.

25. At daylight, June 1st, the Battle Fleet, being then to the southward and westward of the Horn Reef, turned to the northward in search of enemy vessels, and for the purpose of collecting our own cruisers and torpedo-boat destroyers. At 2.30 a.m. Vice-Admiral Sir Cecil Burney transferred his flag from Marlborough to Revenge, as the former ship had some difficulty in keeping up the speed of the squadron. Marlborough was detached by my direction to a base, being unsuccessfully attacked en route by enemy submarines. The visibility early on June 1st (3 to 4 miles) was less than on May 31st, and difficulty was experienced in meeting all ships, the torpedo-boat destroyers not rejoining until 9 a.m. The waters from the latitude of the Horn Reef to the scene of the action were thoroughly searched, and some survivors from the destroyers Ardent, Fortune, and Tipperary were picked up, and the Sparrowhawk, which had been in collision and was no longer seaworthy, was sunk after her crew had been taken off. A large amount of wreckage was seen, but no enemy ships, and at 1.15 p.m., it being evident that the German Fleet had succeeded in returning to port, course was shaped for our bases, which were reached without further incident on Friday, June 2nd. A cruiser squadron was detached to search for Warrior, which vessel had been abandoned whilst in tow of Engadine on her way to the base owing to bad weather setting in and the vessel becoming unseaworthy, but no trace of her was discovered, and a further subsequent search by a light-cruiser squadron having failed to locate her, it is evident that she foundered.

Searching the North Sea.

26. The Fleet fuelled and replenished with ammunition, and at 9.30 p.m. on June 2nd was reported ready for further action.

Losses.

Losses of enemy.

27. The conditions of low visibility under which the day action took place, the approach of darkness and the tactics adopted by the enemy of retiring under cover of torpedo attacks, enhance the difficulty of giving an accurate report of the damage inflicted or the names of the ships sunk by our forces, but after a most careful examination of the evidence of all officers, who testified to seeing enemy vessels actually sink, and personal interviews with a large number of these officers, I am of opinion that the list shown in the enclosure gives the minimum in regard to numbers, though it is possibly not entirely accurate as regards the particular class of vessel, particularly those which were sunk during the night attacks. In addition to the vessels sunk, it is unquestionable that many other ships were very seriously damaged by gunfire and by torpedo attack.

28. The enemy fought with the gallantry that was expected of him, and showed humanity in rescuing officers and men from the water. I particularly admired the conduct of those on board a disabled German light cruiser which passed down the British line shortly after deployment, under a heavy fire, which was returned by the only gun left in action. But after the arrival of the British Battle Fleet there appeared to be no desire on the part of the High Sea Fleet to continue the engagement. The battleships turned away on each occasion of being sighted soon after fire was opened, and although the British Fleet remained in the proximity of the battlefield and near the line of approach to German ports until 11 a.m. on June 1st, in spite of the disadvantage of long distance from fleet bases and the danger incurred in waters adjacent to enemy coasts from submarines and torpedo craft, the enemy made no sign, and I was reluctantly compelled to the conclusion that the High Sea Fleet had returned into port. Subsequent events proved this assumption to have been correct. Our position must have been known to the enemy, as at 2.50 a.m. the Fleet engaged a Zeppelin for quite five minutes, during which time she had ample opportunity to note and subsequently report the position and course of the British Fleet.

British losses.

29. I deeply regret to report the loss of H.M. ships mentioned, and still more do I regret the resultant heavy loss of life. The deaths of such gallant and distinguished officers as Rear-Admiral Sir Robert Arbuthnot, Bart., Rear-Admiral the Hon. Horace Hood, Captain Charles F. Sowerby, Captain Cecil I. Prowse, Captain Arthur L. Cay, Captain Thomas P. Bonham, Captain Charles J. Wintour, and Captain Stanley V. Ellis, and those who perished with them, is a serious loss to the Navy and to the country. They led officers and men who were equally gallant, and whose death is mourned by their comrades in the Grand Fleet. They fell doing their duty nobly, a death which they would have been the first to desire.

The Personnel of the Fleet.

30. The conduct of officers and men throughout the day and night actions was entirely beyond praise. No words of mine could do them justice. On all sides it is

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reported to me that the glorious traditions of the past were most worthily upheld—whether in heavy ships, cruisers, light cruisers, or destroyers—the same admirable spirit prevailed. Officers and men were cool and determined, with a cheeriness that would have carried them through anything. The heroism of the wounded was the admiration of all. Conduct of officers and men.

I cannot adequately express the pride with which the spirit of the Fleet filled me.

31. I have now given details of the work of the various ships during action. It must never be forgotten, however, that the prelude to action is the work of the engine-room department, and that during action the officers and men of that department perform their most important duties without the incentive which a knowledge of the course of the action gives to those on deck. The qualities of discipline and endurance are taxed to the utmost under these conditions, and they were, as always, most fully maintained throughout the operations under review. Many ships attained speeds that had never before been reached, thus showing very clearly their high state of steaming efficiency. Failures in material were conspicuous by their absence, and many instances are reported of magnificent work on the part of the engine-room departments of injured ships. Engine-room *personnel.*

32. The work of the medical officers of the Fleet, carried out very largely under the most difficult conditions, was entirely admirable and invaluable. Lacking in many cases all the essentials for performing critical operations, and with their staff seriously depleted by casualties, they worked untiringly and with the greatest success. To them we owe a deep debt of gratitude.

33. It will be seen that the hardest fighting fell to the lot of the Battle-cruiser Fleet, the Fifth Battle Squadron, and the Flotillas. This was inevitable under the conditions, and the squadrons and flotillas mentioned, as well as the individual vessels composing them, were handled with conspicuous ability, as also were the First, Second, and Fourth Squadrons of the Battle Fleet and the Second Cruiser Squadron.

34. In paragraph 3 of this despatch I have named the Commanding Officers of all the ships mentioned above, and I desire to place on record my high appreciation of the manner in which all vessels were handled. The conditions were such as to call for great skill and ability, quick judgment and decisions, and this was conspicuous throughout the day.

I beg also to draw special attention to the services rendered by Vice-Admiral Sir Cecil Burney (Second in Command of the Grand Fleet), Vice-Admiral Sir Thomas Jerram, Vice-Admiral Sir Doveton Sturdee, Rear-Admiral Hugh Evan-Thomas, Rear-Admiral Alexander L. Duff, Rear-Admiral Arthur C. Leveson, and Rear-Admiral Ernest F. A. Gaunt, commanding squadrons or divisions in the Battle Fleet. They acted throughout with skill and judgment. Sir Cecil Burney's squadron owing to its position, was able to see more of the enemy Battle Fleet than the squadrons ahead, and, under a leader who has rendered me most valuable and loyal assistance at all times, the squadron did excellent work. The magnificent squadron commanded by Rear-Admiral Evan-Thomas formed a support of great value to Sir David Beatty during the afternoon, and was brought into action in rear of the Battle Fleet in the most judicious manner in the evening. Services of Flag Officers.

Sir David Beatty once again showed his fine qualities of gallant leadership, firm determination, and correct strategic insight. He appreciated the situation at once on sighting first the enemy's lighter forces, then his battle-cruisers, and finally his Battle Fleet. I can fully sympathise with his feelings when the evening mist and fading light robbed the Fleet of that complete victory for which he had manœuvred, and for which the vessels in company with him had striven so hard. The services rendered by him, not only on this, but on two previous occasions, have been of the very greatest value. Sir David Beatty.

Sir David Beatty brings to my notice the brilliant support afforded him by Rear-Admiral Hugh Evan-Thomas, the magnificent manner in which Rear-Admiral the Hon. Horace Hood brought his squadron into action, the able support afforded him by Rear-Admiral William C. Pakenham and Rear-Admiral Osmond de B. Brock, and the good work performed by the Light-cruiser Squadrons under the command respectively of Rear-Admiral Trevylyan D. W. Napier, Commodore William E. Goodenough, and Commodore Edwyn S. Alexander-Sinclair. He states that on every occasion these officers anticipated his wishes and used their forces to the best possible effect. I most fully endorse all his remarks, and I forward also the following extract from his report regarding the valuable services rendered by his staff:—

> "I desire to bring to your notice the great assistance that I received on a day of great anxiety and strain from my Chief of the Staff, Captain Rudolf W. Bentinck, whose good judgment was of the greatest help. He was a tower of strength. My Flag-Commander, the Hon. Reginald A. R. Plunkett, was most valuable in observing the effect of our fire, thereby enabling me to take advantage Battle-cruiser Fleet Staff.

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of the enemy's discomfiture; my Secretary, Frank T. Spickernell, who made accurate notes of events as they occurred, which proved of the utmost value in keeping the situation clearly before me; my Flag Lieut.-Commander Ralph F. Seymour, who maintained efficient communications under the most difficult circumstances, despite the fact that his signalling appliances were continually shot away. All these officers carried out their duties with great coolness on the manœuvring platform, where they were fully exposed to the enemy's fire."

Sir Charles Madden.

35. I cannot close this despatch without recording the brilliant work of my Chief of the Staff, Vice-Admiral Sir Charles Madden, K.C.B., C.V.O. Throughout a period of 21 months of war his services have been of inestimable value. His good judgment, his long experience in fleets, special gifts for organisation, and his capacity for unlimited work, have all been of the greatest assistance to me, and have relieved me of much of the anxiety inseparable from the conduct of the Fleet during the war. In the stages leading up to the Fleet Action and during and after the action, he was always at hand to assist, and his judgment never at fault. I owe him more than I can say.

Sir John Jellicoe's Staff.

My special thanks are due also to Commodore Lionel Halsey, C.M.G., the Captain of the Fleet, who also renders me much assistance in the working of the Fleet at sea, and to whose good organisation is largely due the rapidity with which the Fleet was fuelled and replenished with ammunition on return to its bases. He was of much assistance to me during the action.

Commander Charles M. Forbes, my Flag-Commander, and Commander Roger M. Bellairs, of my Staff, plotted the movements of the two Fleets with rapidity and accuracy as reports were received; Commander the Hon. Matthew R. Best, M.V.O., of my Staff, acted as observer aloft throughout the action, and his services were of value. These officers carried out their duties efficiently during the action.

The signals were worked with smoothness and rapidity by Commander Alexander R. W. Woods, assisted by the other signal officers, and all ships responded remarkably well under difficult conditions. My Flag-Lieutenant, Lieut.-Commander Herbert Fitzherbert, was also of much service to me throughout the action.

The high state of efficiency of the W.T. arrangements of the Fleet, and the facility with which they were worked before, during, and after the action, is a great testimony to the indefatigable work carried out by Commander Richard L. Nicholson. His services have been invaluable throughout the war.

A special word of praise is due to the wireless departments in all ships.

My Secretaries, Fleet Paymasters Hamnet H. Share, C.B., and Victor H. T. Weekes, recorded with accuracy salient features of the action. Their records have been of much assistance.

To the Master of the Fleet, Captain Oliver E. Leggett, I am indebted for the accuracy with which he kept the reckoning throughout the operations.

36. In a separate despatch I propose to bring to the notice of their Lordships the names of other officers and men who did not come under my personal observation, but who had the opportunity of specially distinguishing themselves.

I am, Sir,
Your obedient Servant,
J. R. JELLICOE, Admiral,
Commander-in-Chief.

[ENCLOSURE.]

LIST OF ENEMY VESSELS CONSIDERED TO HAVE BEEN SUNK MAY 31–JUNE 1, 1916.

BATTLESHIPS OR BATTLE-CRUISERS.

2 Battleships, "Dreadnought" type	Certain.
1 Battleship, "Deutschland" type	
1 Battleship or Battle-Cruiser	Probable.
1 Battleship, "Dreadnought" type	

LIGHT-CRUISERS.

4 Light-Cruisers	Certain.
1 Heavy ship or Light-Cruiser	

TORPEDO-BOAT DESTROYERS.

6 Torpedo-boat Destroyers	Certain.
3 Torpedo-boat Destroyers	Probable.

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SUBMARINES.

1 Submarine	Certain.
3 Submarines	Possible.

[With reference to the above list of assumed German losses, Lord Jellicoe's remarks on the superior protection of German ships—"The Grand Fleet, 1914-16," p. 316—should be read. After the battle of Jutland several of the German ships very seriously damaged were able to return to port and were repaired. The Seydlitz was hit by twenty-eight shells and a torpedo; the König was hit fifteen times, and five shells near the water-line did not perforate the plating; the Markgraf was very badly damaged, including a hit by a torpedo; the Ostfriesland had a large hole torn in her side by a mine-explosion; the Derfflinger was very severely handled. All these and others reached port.]

VICE-ADMIRAL BEATTY'S REPORT.

Nearly the whole of this report was included by Admiral Jellicoe in his own despatch, given above. It opened by stating that at 2.37 p.m. on May 31st the Vice-Admiral was cruising and steering to the northward to join the Admiral's flag. The following portion was not quoted by the Admiral:—

Lion, *June* 19, 1916. Sir David Beatty on the battle.

It is impossible to give a definite statement of the losses inflicted on the enemy. The visibility was for the most part low and fluctuating, and caution forbade me to close the range too much with my inferior force.

A review of all the reports which I have received leads me to conclude that the enemy's losses were considerably greater than those which we had sustained, in spite of their superiority, and included battleships, battle-cruisers, light cruisers, and destroyers.

This is eloquent testimony to the very high standard of gunnery and torpedo efficiency of His Majesty's ships. The control and drill remained undisturbed throughout, in many cases despite heavy damage to material and *personnel*. Our superiority over the enemy in this respect was very marked, their efficiency becoming rapidly reduced under punishment, while ours was maintained throughout.

As was to be expected, the behaviour of the ships' companies under the terrible conditions of a modern sea battle was magnificent without exception. The strain on their moral was a severe test of discipline and training. Officers and men were imbued with one thought, the desire to defeat the enemy. The fortitude of the wounded was admirable.

A report from the commanding officer of Chester gives a splendid instance of devotion to duty. Boy (1st class) John Travers Cornwell, of Chester, was mortally wounded early in the action. He nevertheless remained standing alone at a most exposed post, quietly awaiting orders till the end of the action, with the gun's crew dead and wounded all round him. His age was under 16½ years. I regret that he has since died, but I recommend his case for special recognition in justice to his memory, and as an acknowledgment of the high example set by him.

In such a conflict as raged continuously for five hours, it was inevitable that we should suffer severe losses. It was necessary to maintain touch with greatly superior forces in fluctuating visibility, often very low. We lost Invincible, Indefatigable, and Queen Mary, from which ships there were few survivors. The casualties in other ships were heavy, and I wish to express my deepest regret at the loss of so many gallant comrades, officers and men. They died gloriously.

Exceptional skill was displayed by the Medical Officers of the Fleet. They performed operations and tended the wounded under conditions of extreme difficulty. In some cases their staff was seriously depleted by casualties, and the inevitable lack of such essentials as adequate light, hot water, etc., in ships damaged by shell fire, tried their skill, resource, and physical endurance to the utmost.

As usual, the Engine Room Departments of all ships displayed the highest technical skill, discipline and endurance. High speed is a primary factor in the tactics of the squadron under my command, and the Engine Room Departments never fail.

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BRITISH SHIPS AT THE BATTLE OF JUTLAND.

Name and Captain.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
BATTLESHIPS.				
Fleet Flagship.				
IRON DUKE . . . Capt. F. C. Dreyer, C.B.	25,000	21	10 13·5 12 6	Flag of Admiral Sir J. Jellicoe (Commander-in-Chief). Leading Third Division.
Third Division.				
ROYAL OAK . . . Capt. C. Maclachlan	25,750	21·5	8 15 14 6	
SUPERB . . . . Capt. E. Hyde Parker	18,600	21	10 12 12 4	Flag of Rear-Adm. A. L. Duff (Rear-Adm. Fourth Battle Squadron).
CANADA . . . . Capt. W. C. M. Nicholson	28,000	22·75	10 14 12 6	
First Division.				
KING GEORGE V. . Capt. F. L. Field	23,000	21	10 13·5 12 4	Flag of Vice-Adm. Sir T. H. M. Jerram (Comdg. Second Battle Squadron).
AJAX . . . . . Capt. G. H. Baird	23,000	21	10 13·5 12 4	
CENTURION . . . Capt. M. Culme-Seymour	23,000	21	10 13·5 12 4	
ERIN . . . . . Capt. Hon. V. A. Stanley	23,000	21	10 13·5 16 6	
Second Division.				
ORION . . . . . Capt. O. Backhouse	22,500	21	10 13·5 13 4	Flag of Rear-Adm. A. C. Leveson (Rear-Adm. Second Battle Squadron).
MONARCH . . . Capt. G. H. Borrett	22,500	21	10 13·5 13 4	
CONQUEROR . . . Capt. H. H. D. Tothill	22,500	21	10 13·5 13 4	
THUNDERER . . . Capt. J. A. Fergusson	22,500	21	10 13·5 13 4	
Fourth Division.				
BENBOW . . . . . Capt. H. W. Parker	25,000	21	10 13·6 12 6	Flag of Vice-Adm. Sir D. Sturdee (Comdg. Fourth Battle Squadron).
BELLEROPHON . . Capt. E. F. Bruen	18,600	21	10 12 12 4	
TEMERAIRE . . . Capt. E. V. Underhill	18,600	21	10 12 12 4	
VANGUARD . . . Capt. J. D. Dick	19,250	21	10 12 13 4	
Fifth Division.				
COLOSSUS . . . . Capt. A. D. P. R. Pound	20,000	21	10 12 12 4	Flag of Rear-Adm. E. F. A. Gaunt (Rear-Adm. First Battle Squadron). Received 2 12-in. hits.
COLLINGWOOD . . Capt. J. C. Ley	19,250	21	10 12 13 4	
NEPTUNE . . . . Capt. V. H. G. Bernard	19,000	21	10 12 12 4	
ST. VINCENT . . . Capt. W. W. Fisher	19,250	21	10 12 13 4	

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Name and Captain.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
BATTLESHIPS—*continued.*				
Sixth Division.				
MARLBOROUGH . . Capt. G. P. Ross	25,000	21	10 13·5 12 6	Flag of Vice-Adm. Sir C. Burney (Com. First Battle Squadron), Second-in-Comd. Struck by torpedo.
REVENGE . . . . Capt. E. B. Kiddle	25,750	21·5	8 15 14 6	
HERCULES . . . Capt. L. Clinton-Baker	20,000	21	10 12 12 4	
AGINCOURT . . . Capt. H. M. Doughty	27,500	22	14 12 20 6	
Fast Division (Detached).				
BARHAM . . . . Capt. A. W. Craig	27,500	25	8 15 12 6	Flag of Rear-Adm. H. Evan-Thomas (Comdg. Fifth Battle Squadron). Hit 5 times; 1 shell damaged wireless office, etc.
WARSPITE . . . Capt. E. M. Phillpotts	27,500	25	8 15 12 6	Hit 28 times, mostly during the jamming of steering-gear; damaged considerably, and returned independently to Rosyth.
VALIANT . . . . Capt. M. Woollcombe	27,500	25	8 15 12 6	
MALAYA . . . . Capt. Hon. A. D. E. H. Boyle	27,500	25	8 15 12 6	Hit 8 times, minor damage only.
BATTLE-CRUISERS.				
LION . . . . . Capt. A. E. M. Chatfield	26,350	28	8 13·5 15 4	Flag of Vice-Adm. Sir D. Beatty (Comdg. Battle-cruiser Fleet). Hit 12 times. Q turret wrecked and repaired. Several casualties, and fires started.
First Squadron.				
PRINCESS ROYAL . Capt. W. H. Cowan	26,350	28	8 13·5 15 4	Flag of Rear-Adm. O. de B. Brock (Comdg. First Battle-cruiser Squadron). 9 hits, one putting X turret out of action.
TIGER . . . . . Capt. H. B. Pelly	28,500	29	8 13·5 12 6	Four hits. 1 gun in X and 1 in Q turrets damaged.
QUEEN MARY . . Capt. C. I. Prowse	26,350	28	8 13·5 15 4	Sunk by gunfire, 4.26 p.m.
Second Squadron.				
NEW ZEALAND . . Capt. J. F. E. Green	18,800	26	8 12 14 4	Flag of Rear-Adm. W. C. Pakenham (Comdg. Second Battle-cruiser Squadron). Hit by heavy shell on side of X turret, but only slight damage was caused to turret base and deck.
INDEFATIGABLE . . Capt. C. F. Sowerby	18,800	26	8 12 14 4	Sunk by gunfire, 4.6 p.m.

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Name and Captain.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
BATTLE-CRUISERS—*continued.*				
Third Squadron.				
INVINCIBLE . . . Capt. A. L. Cay	17,250	25	8 12 12 4	Flag of Rear-Adm. The Hon. H. Hood (Comdg. Third Battle-cruiser Squadron). Sunk by gunfire, 6.34 p.m.
INDOMITABLE . . . Capt. F. W. Kennedy	17,250	25	8 12 12 4	Struck only by shell splinters, no one injured.
INFLEXIBLE . . . Capt. E. H. F. Heaton-Ellis	17,250	25	8 12 12 4	
ARMOURED CRUISERS.				
Second Squadron.				
MINOTAUR . . . Capt. A. C. S. H. D'Aeth	14,600	23	4 9.2 10 7·5	Flag of Rear-Adm. H. L. Heath (Comdg. Second Cruiser Squadron).
HAMPSHIRE . . . Capt. H. J. Savill	10,850	22·2	4 7·5 6 6	
COCHRANE . . . Capt. E. La T. Leatham	13,650	22·5	6 9·2 4 7·5	
SHANNON . . . Capt. J. S. Dumaresq	14,600	23	4 9·2 10 7·5	
First Squadron.				
DEFENCE . . . Capt. S. V. Ellis	14,600	23	4 9·2 10 7·5	Flag of Rear-Adm. Sir R. Arbuthnot (Comdg. First Cruiser Squadron). Sunk by gunfire, 6.16 p.m.
DUKE OF EDINBURGH Capt. H. Blackett	13,650	23	6 9·2 10 6	
BLACK PRINCE . . Capt. T. P. Bonham	13,650	23	6 9·2 10 6	Sunk in night action, probably by gunfire.
WARRIOR . . . Capt. V. B. Molteno	13,650	22·5	6 9·2 4 7·5	Disabled by gunfire about 6.16 p.m. foundered later; crew saved.
LIGHT CRUISERS.				
Third Squadron.				
FALMOUTH . . . Capt. J. D. Edwards	5,250	25·5	8 6	Flag of Rear-Adm. T. D. W. Napier, (Comdg. Third Light-cruiser Squadron). 1 direct hit; no casualties.
BIRKENHEAD . . Capt. E. Reeves	5,250	25	10 5·5	
GLOUCESTER . . . Capt. W. F. Blunt	4,800	25·5	2 6 10 4	
YARMOUTH . . . Capt. T. D. Pratt	5,250	25·5	8 6	
Second Squadron.				
SOUTHAMPTON . . Commodore W. E. Goodenough	5,400	25·5	8 6	Flag of Second Light-cruiser Squadron.
NOTTINGHAM . . Capt. C. B. Miller	5,440	25·5	9 6	Struck by shell splinters; no casualties.
BIRMINGHAM . . . Capt. A. A. M. Duff	5,440	25·5	9 6	Struck by shell splinters; no casualties.
DUBLIN . . . . Capt. A. C. Scott	5,400	25·5	8 6	Hit early in action by splinters from 12-in. shell, and in night action by about 13 shells, one killing navigating officer.

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Name and Captain.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
LIGHT CRUISERS—*continued.*				
First Squadron.				
GALATEA Commodore E. S. Alexander-Sinclair	3,500	30	2 6 7 4	Flag of First Light-cruiser Squadron. Hit by 1 5·9-in. shell, which did not burst.
INCONSTANT Capt. B. S. Thesiger	3,500	30	2 6 7 4	
PHAETON Capt. J. E. Cameron	3,500	30	2 6 7 4	
CORDELIA Capt. T. P. H. Beamish	3,750	30	2 6 8 4	
Fourth Squadron.				
CALLIOPE Commodore C. E. Le Mesurier	3,750	30	2 6 8 4	Flag of Fourth Light-cruiser Squadron. Hit by 5·9-in. shell on loading tray of 4-in. gun, which was disabled and crew all killed or wounded. Three other hits caused casualties and damage.
CAROLINE Capt. H. R. Crooke	3,750	30	2 6 8 4	
COMUS Capt. A. G. Hotham	3,750	30	2 6 8 4	
CONSTANCE Capt. C. S. Townsend	3,750	30	4 6	
Attached Ships.				
ACTIVE Capt. P. Withers	3,360	25	10 4	Repeating ships.
BELLONA Capt. A. B. S. Dutton	3,300	25·5	6 4	Repeating ships.
BOADICEA Capt. L. C. S. Woollcombe	3,300	25·5	6 4	Repeating ships.
BLANCHE Capt. J. M. Casement	3,360	25	10 4	Repeating ships.
ROYALIST Capt. Hon. H. Meade	3,500	30	4 6 7 4	
CANTERBURY Capt. P. M. R. Royds	3,750	30	4 6	Hit by 1 4·1-in. shell, which did not burst.
CHESTER Capt. R. N. Lawson	5,250	26·5	10 5·5	Received 17 direct hits; 3 guns disabled, after-control destroyed.
CASTOR Commodore J. R. P. Hawksley	3,750	30	4 6	Flag of Destroyer Flotillas, and Leader of Eleventh Flotilla. Struck by several shells; one killed 5 men under a 4-in. gun, 3 struck fore-bridge, killing 5 men, and several struck the side armour; there were 23 wounded.
CHAMPION Capt. J. U. Farie	3,750	30	2 6 8 4	Flag of Thirteenth Destroyer Flotilla.
FEARLESS Capt. C. D. Roper	3,360.	25	10 4	Flag of First Destroyer Flotilla.
ENGADINE Lt.-Com. C. G. Robinson				Seaplane carrier; seaplane sent up, 3.8 p.m.

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DESTROYERS.

Name and Captain.	Remarks.	Name and Captain.	Remarks.
TIPPERARY . . . Capt. C. J. Wintour	Flag of Fourth Destroyer Flotilla. Sunk in night action.	MAENAD . . . . Com. J. P. Champion	
BROKE . . . . Com. W. L. Allen		NARWHAL . . . Lt.-Com. H. V. Hudson	
SHARK . . . . Com. L. W. Jones	Sunk about 6 p.m.	NESSUS . . . . Lt.-Com. E. Q. Carter	
ACASTA . . . . Lt.-Com. J. O. Barron	Disabled about 6 p.m., towed home by Nonsuch.	NOBLE. . . . . Lt.-Com. H. P. Boxer	
SPITFIRE . . . . Lt.-Com. C. W. E. Trelawny		OPAL . . . . . Com. C. G. C. Sumner	
SPARROWHAWK . . Lt.-Com. S. Hopkins	Rammed by Broke 11.30 p.m., and sunk by Marksman.	NONSUCH . . . . Lt.-Com. H. I. N. Lyon	Assisted and towed home Acasta.
ACHATES . . . . Com. R. B. C. Hutchinson . .		MENACE . . . . Lt.-Com. C. A. Poignand	
AMBUSCADE . . . Lt.-Com. G. A. Coles		MONSTER . . . . Lt.-Com. S. F. Russell	
ARDENT . . . . Lt.-Com. A. Marsden	Sunk in night action.	MARY ROSE . . . Lt.-Com. E. A. Homan	
FORTUNE . . . . Lt.-Com. F. G. Terry	Sunk in night action.	MISCHIEF . . . . Lt.-Com. Hon. C. A. Ward	
PORPOISE . . . . Com. H. D. Colville		OAK . . . . . Lt.-Com. D. Faviell	
UNITY . . . . . Lt.-Com. A. M. Lecky		ABDIEL . . . . . Com. B. Curtis	Minelaying Flotilla leader.
GARLAND . . . . Lt.-Com. R. S. Goff		NESTOR . . . . Com. Hon. E. B. S. Bingham	Sunk by German Battleships about 4.25 p.m.
CHRISTOPHER. . . Lt.-Com. F. M. Kerr		NOMAD . . . . Lt.-Com. P. Whitfield	Sunk by German Battleships about 4.25 p.m.
CONTEST . . . . Lt.-Com. E. G. H. Master		NARBOROUGH. . . Lt.-Com. G. Corlett	
OWL . . . . . Com. R. G. Hamond		OBDURATE . . . Lt.-Com. C. H. H. Sams	
HARDY . . . . Com. R. A. A. Plowden		PETARD . . . . Lt.-Com. E. C. O. Thomson	Damaged in night action.
MIDGE . . . . Lt.-Com. J. R. C. Cavendish		PELICAN . . . . Lt.-Com. K. A. Beattie	
OPHELIA . . . . Com. L. G. E. Crabbe		NERISSA . . . . Lt.-Com. M. G. B. Legge	
KEMPENFELT . . Com. H. E. Sulivan		ONSLOW . . . . Lt.-Com. J. C. Tovey	Disabled about 6.5 p.m., towed home by Defender.
OSSORY . . . . Com. H. V. Dundas		MORESBY . . . . Lt.-Com. R. V. Alison	Assisted Engadine with her seaplane.
MARTIAL . . . . Lt.-Com. J. Harrison		NICATOR . . . . Lieut. J. E. A. Mocatta	
MAGIC . . . . Lt.-Com. G. C. Wynter			
MINION . . . . Lt.-Com. H. C. Rawlings			
MYSTIC . . . . Com. C. F. Allsup			

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DESTROYERS—*continued.*

Name and Captain.	Remarks.	Name and Captain.	Remarks.
MONS . . . . . Lt.-Com. R. Makin		ACHERON . . . . Com. C. G. Ramsey	
MANDATE . . . . Lt.-Com. E. McC. W. Laurie . . .		ARIEL . . . . . Lt.-Com. A. G. Tippet	
MICHAEL . . . . Lt.-Com. C. L. Bate		ATTACK . . . . Lt.-Com. C. H. N. James	
MARNE . . . . Lt.-Com. G. B. Hartford		HYDRA . . . . Lieut. F. G. Glossop	
MILBROOK . . . Lt. C. G. Naylor		BADGER . . . . Com. G. A. Fremantle	Rescued survivors of Invincible.
MANNERS . . . . Lt.-Com. G. C. Harrison . . .		GOSHAWK . . . . Com. D. F. Moir	
MOON . . . . Com. (actg.) W. D. Irvin		DEFENDER . . . Lt.-Com. L. R. Palmer	Damaged by shell-fire, but assisted and towed Onslow.
MOUNSEY . . . . Lt.-Com. R. V. Eyre		LIZARD . . . . Lt.-Com. E. Brooke	
MORNING STAR . . Lt.-Com. H. U. Fletcher		LAPWING . . . . Lt.-Com. A. H. Gye	
FAULKNOR . . . Capt. A. J. B. Stirling	Flag of Twelfth Destroyer Flotilla.	LYDIARD . . . . Com. M. L. Goldsmith	
MARKSMAN . . . Com. N. A. Sulivan		LIBERTY . . . . Lt.-Com. P. W. S. King	
OBEDIENT . . . Com. G. W. McC. Campbell		LANDRAIL . . . Lt.-Com. F. E. H. G. Hobart	
MINDFUL . . . . Lt.-Com. J. J. C. Ridley		LAUREL . . . . Lieut. H. D. C. Stanistreet	
MARVEL . . . . Lt.-Com. R. W. Grubb		MOORSOM . . . . Com. J. C. Hodgson	
ONSLAUGHT . . . Lt.-Com. A. G. Onslow		MORRIS . . . . Lt.-Com. E. S. Graham	
		TURBULENT . . . Lt.-Com. D. Stuart	Sunk by gunfire in night action.
		TERMAGANT . . . Lt.-Com. C. P. Blake	

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GERMAN SHIPS AT THE BATTLE OF JUTLAND.

Name.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
BATTLESHIPS.				
Fleet Flagship.				
FRIEDRICH DER GROSSE	24,310	21	10 12 14 5·9	Flag of Vice-Adm. Reinhold Scheer (Commander-in-Chief).
Third Squadron.				
KÖNIG	25,390	21	10 12 14 5·9	Flag of Rear-Adm. Behncke. Was struck 15 times. Repairs were completed by Aug. 12.
GROSSER KURFÜRST	25,390	21	10 12 14 5·9	Damaged by a torpedo and by four heavy shells. Her casualties were 33.
MARKGRAF . . .	25,390	22	10 12 14 5·9	Badly damaged, apparently including a hit by a torpedo.
KRONPRINZ WILHELM	25,390	22	10 14 14 5·9	
KAISER	24,310	21	10 12 14 5·9	
PRINZ REGENT LUITPOLD	24,310	21	10 12 14 5·9	
KAISERIN	24,310	21	10 12 14 5·9	
First Squadron.				
THÜRINGEN . . .	22,440	20·5	12 12 14 5·9	
HELGOLAND . . .	22,440	20·5	12 12 14 5·9	
OLDENBURG . . .	22,440	20·5	12 12 14 5·9	Hit by a 4-in. shell from a destroyer, which killed 11 and wounded 12, mostly officers, on the bridge.
OSTFRIESLAND . .	22,440	20·5	12 12 14 5·9	Struck a mine, which tore a large hole in her starboard side.
POSEN	18,600	20·0	12 11 12 5·9	
RHEINLAND . . .	18,600	20·0	12 11 12 5·9	Hit twice, 8 killed, 15 wounded.
NASSAU	18,600	20·0	12 11 12 5·9	
WESTFALEN . . .	18,600	20·0	12 11 12 5·9	
Second Squadron.				
SCHLESIEN . . .	12,997	18	4 11 14 6·7	Damaged by collision.
HESSEN	12,997	18	4 11 14 6·7	
HANNOVER . . .	12,997	18	4 11 14 6·7	
SCHLESWIG-HOLSTEIN	12,997	18	4 11 14 6·7	Hit by two shells, one of which knocked out a casemate.
POMMERN . . .	12,997	18	4 11 14 6·7	Torpedoed and sunk.
DEUTSCHLAND . .	12,997	18	4 11 14 6·7	

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Name.	Displacement.	Nominal Speed.	Heavy Guns.	Remarks.
	Tons.	Knots.	Inch.	
BATTLE-CRUISERS.				
First Scouting Group.				
SEYDLITZ	24,610	26·75	10 11 12 5·9	Beached in a sinking condition. She rejoined the Fleet in September.
DERFFLINGER	26,180	28·0	8 12 14 5·9	Seven hits, which did serious damage to turrets, casemates, and belt.
LÜTZOW	26,188	28·0	8 12 14 5·9	Flag of Rear-Admiral von Hipper, who transferred to the Moltke. Sunk with 400 to 600 casualties.
MOLTKE	22,640	27·25	10 11 12 5·9	Three hits by big shells and 6 others, and was under repair until August.
VON DER TANN	19,100	26·0	8 11 10 5·9	Took six weeks to repair.
LIGHT CRUISERS.				
Second Scouting Group.				
REGENSBERG	4,900	27·25	7 5·9 1 A.A. 2 M.M.	
ROSTOCK	4,832	27·0	12 4·1 2 M.M.	Sunk after damage by gunfire and torpedoes.
PILLAU	4,350	27·5	8 5·9 2 A.A.	
FRANKFURT	5,400	28·0	8 5·9 2 A.A.	
WIESBADEN	5,400	28·0	8 5·9 2 A.A.	Sunk by First Cruiser Squadron. She was reduced to a complete wreck by gunfire and finally torpedoed. Twenty-two men got away on a raft, but only one survived.
ELBING	4,350	27·5	8 5·9 2 A.A.	Sunk after attack by the Castor and 2 destroyers.
Fourth Scouting Group.				
STETTIN	3,550	24·0	10 4·1 2 M.M.	
STUTTGART	3,396	24·0	10 4·1 2 M.M.	
MÜNCHEN	3,200	23·0	10 4·1 2 M.M.	
BERLIN	3,200	23·0	10 4·1 2 M.M.	
FRAUENLOB	2,672	21·0	10 4·1 2 M.M.	Torpedoed and sunk. Eight survivors.
DESTROYERS.				
1ST FLOTILLA 2ND ,, 3RD ,, 5TH ,, 6TH ,, 7TH ,, 9TH ,,				A flotilla consisted of 11 boats. Therefore if all units were present, the total number of boats was 77. Five destroyers are known to have been sunk, and many more were considerably damaged, so that although towed home they were not worth repair.

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ZEEBRUGGE AND OSTEND OPERATIONS.

THE following are the despatches of Vice-Admiral Sir Roger Keyes, K.C.B., C.V.O., D.S.O., commanding the Dover Patrol, on the Zeebrugge and Ostend operations, April 22–23, 1918, and the Ostend operations, May 10, 1918, issued by the Admiralty February 19, 1919 :—

REPORT OF VICE-ADMIRAL, DOVER PATROL, ON OPERATIONS, APRIL 22–23, 1918.

Fleet House, Dover,
**May* 9, 1918.

Sir,—Be pleased to submit for the information of the Lords Commissioners of the Admiralty the following Report on the Operations on the Belgian Coast on the night of April 22–23, 1918.

I.—GENERAL SUMMARY.

2. To make the report clear, the different sections of the operations have been separated as much as possible. Fuller details than appear in this despatch will be found in the complete set of orders and reports forwarded herewith.

(NOTE.—These orders and reports are not published with this despatch.)

3. The main objects of the enterprise were (1) to block the Bruges ship-canal at its entrance into the harbour of Zeebrugge ; (2) to block the entrance to Ostend harbour from the sea; (3) and to inflict as much damage as possible upon the ports of Zeebrugge and Ostend.

Zeebrugge harbour and ship canal.

4. Zeebrugge harbour is connected by a ship-canal with the inland docks at Bruges, which communicate again by means of a system of smaller canals with Ostend harbour. The whole forms a triangle with two sea entrances. The eastern side, which is eight miles long, is the ship-canal from Zeebrugge to Bruges; the southern side, which is eleven miles long, consists of smaller canals from Bruges to Ostend ; the base, facing north-west, is the twelve miles of heavily fortified coast line between Ostend and Zeebrugge. This fortified line is prolonged eight and a-half miles to the westward, extending to the right flank of the German Army, facing Nieuport, and seven miles to the eastward as far as the Dutch frontier. The defences include a number of batteries mounting over 225 guns, 136 of which are from 6-in. to 15-in. calibre, the latter ranging up to 42,000 yards.

5. This formidable system has been installed since the German occupation in 1914, and Bruges has recently provided a base for at least thirty-five enemy torpedo craft, and about thirty submarines. By reason of its position and comparative security it has constituted a continual and ever-increasing menace to the sea communications of our Army and the sea-borne trade and food supplies of the United Kingdom.

6. When the operations of April 22nd–23rd were undertaken it was believed that, although the blocking of the Zeebrugge entrance to the Bruges ship-canal was the most important of all objects, it would be necessary also to block the entrance to the Ostend harbour in order to seal up the Bruges ship-canal and docks; for unless this were done the lighter craft would still be able to pass to and fro more or less freely through the smaller canals.

7. The attack upon the Zeebrugge Mole, as well as the bombardment of Zeebrugge by monitors and from the air, were designed to distract the attention of the enemy from the main operations. Without this diversion the attempt of the blocking ships to pass round the end of the Mole, to enter the harbour, and to reach the ship-canal entrance at the inner end must almost certainly have been discovered, with the result that the vessels would have been sunk by the shore batteries long before they reached their goal.

8. An important, though subordinate, object of the attack upon the Zeebrugge Mole was to inflict as much damage as was possible in the time upon the harbour works and defences. In order to prevent enemy reinforcements being brought from shore

* Note.—Some amendments to this despatch of May 9, 1918, have been made by the Vice-Admiral, Dover Patrol, in the light of information received between that date and January 22, 1919.

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while this work was in progress arrangements were made for blowing up the viaduct which connected the Mole with the land.

9. Similarly the bombardment of the Ostend defences by our shore batteries in Flanders, by the monitors, and also from the air was designed to cover the attempt to block the entrance to that harbour.

10. It was anticipated that, in addition to the fire from the land batteries and harbour works, the attacking forces would have to face a counter-attack from the powerful destroyer flotilla which was known to be inside. One destroyer emerged from Zeebrugge harbour, and is reported to have been struck by a torpedo fired from C.M.B. No. 5. Other torpedo craft, which apparently had not steam up, remained alongside the Mole, and their crews assisted in its defence. The greater part of the flotilla had for some reason been previously withdrawn to the Bruges docks.

11. As will be seen from the subsequent narrative, our operations were completely successful in attaining their first and most important object. The entrance to the Bruges ship-canal was blocked. The second object—the blocking of the entrance to Ostend harbour—was not achieved, for reasons which will be explained subsequently. The attack on the Zeebrugge Mole was completely successful as a diversion to enable the blocking ships to enter the harbour, to proceed to their allotted stations, and, with the exception of the Thetis, to be sunk in accordance with the plan. The blowing up of the viaduct was carried out without any hitch, and produced the desired results. Owing, however, to various reasons, which will be more particularly dealt with later, the less important objective—the destruction of the defences of the Mole—was not so thorough as had been hoped.

Main results achieved.

12. The main results achieved, however, proved greater than I expected when the fleet returned to port on the morning of April 23rd. Aerial observation and photographs show clearly that even the lighter craft in the Bruges ship-canal and docks have so far been unable to find an exit through the smaller waterways to Ostend harbour. At least twenty-three torpedo craft have remained sealed up at Bruges ever since the operations on St. George's Day, and so far as can be seen not less than twelve submarines would likewise appear to be still imprisoned. As yet no effective steps seem to have been taken to clear the Zeebrugge entrance to the Bruges ship-canal, where the silt is shown to be collecting; and although doubtless in time the enemy will succeed in opening a way out, it seems likely that this important section of his raiding and commerce-destroying forces must inevitably be seriously hampered for a considerable period. In addition to suffering this substantial injury, the enemy has been obliged to bring down reinforcements from the Bight of Heligoland to Zeebrugge and Ostend.

Preparations and concentration.

13. The preparations and training for the attack extended over a long period, during the latter portion of which (*i.e.*, from March 22nd) the Dover Patrol was subjected to an exceptional strain owing to the unprecedented transport of reinforcements to France.

14. Success would have been impossible without the eager and generous co-operation of the Grand Fleet, the neighbouring commands and dockyards, and the Harwich Force.

15. The concentration of the attacking fleet had to take place about sixty-three miles distant from Zeebrugge and Ostend. As the length of time needed for reaching these objectives after the forces had been assembled was seven hours, it was inevitable that there should be a period of not less than four hours of daylight during which enemy observation by air and submarine might discover our movements. In order to guard against this, which would have meant the certain failure of the expedition, it was necessary for the patrols and air forces to show the utmost degree of vigilance and energy. There is every reason for believing that, as a result of their efforts, the enemy remained up to the last entirely unaware of our intentions.

16. In order not only that the attack might have a reasonable prospect of success, but that it might not end in disaster, various conditions were essential—(*a*) a certain state of the tide; (*b*) calm weather; (*c*) a more or less favourable direction of the wind; and (*d*) absence of fog, with, if possible, a moderate amount of haze. The first of these conditions (the state of the tide) fixed the dates between which it was practicable to make the attempt. The others it was not possible to reckon with in advance, owing to the uncertainty of the weather, more especially at that time of year, and also to the fact that all these conditions might be different on the Flanders coast from what they were off the Goodwins, or that they might change for the worse between the starting of the expedition from the point of concentration and its arrival at its destination seven hours later.

17. It was anticipated that minefields, which would endanger the heavier draught vessels, might be encountered in the enemy's waters, but this risk had to be faced, and special arrangements were made to save the crews and storming-parties in the event of vessels being sunk.

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18. On two occasions previous to April 22nd the concentration took place, but, owing to unfavourable weather conditions setting in, had to be dispersed. This fact, although it caused disappointment among the officers and men, and also contained a danger that the enemy might become aware of our designs, had a considerable practical value as a rehearsal of the preliminary stages of the undertaking. On this point I may say here that, although on this occasion the wind changed and served us badly at a moment when we were finally committed to the attack, better conditions had not—since the preparations were completed—occurred before, nor have they recurred up to this date.

19. The main force started from the point of concentration at 4.53 o'clock on the afternoon of Monday, April 22nd.

20. The bombardment of Zeebrugge by monitors began at 11.20 p.m., simultaneously with that of the Ostend defences by monitors, and by our shore batteries in Flanders. These bombardments had been carried out on several nights prior to April 22nd to give the enemy no reason to anticipate further action on our part on this particular occasion.

21. The vessels charged with making a smoke screen began operations simultaneously off Zeebrugge and Ostend at 11.40 p.m.

Time-table and attack.

22. According to time-table, the hour at which the Vindictive (Captain Alfred F. B. Carpenter) should have been laid alongside the Zeebrugge Mole was midnight. She reached her station one minute after midnight, closely followed by the Daffodil (Lieutenant Harold Campbell) and Iris II. (Commander Valentine Gibbs). A few minutes later the landing of the storming and demolition parties began. By 1.10 a.m. the Vindictive had taken off the survivors, who had meanwhile done their work upon the Mole, and by 1.15 a.m. she and her consorts were clear of the Mole.

23. At 2.15 a.m. Submarine C 3 (Lieutenant Richard D. Sandford) had succeeded in ramming herself between the iron piers of the viaduct, and was thereupon abandoned by her crew after they had lit the fuse. Five minutes later the cargo of explosives blew up, completely destroying communication between the Mole and the shore.

Blocking ships.

24. The Thetis (Commander Ralph S. Sneyd, D.S.O.), the first of the blocking ships, passed the end of the Mole, according to arrangement, fifteen minutes after midnight. Making her way to the entrance of the ship-canal, she carried away the obstructing nets, and being then in a sinking condition from gunfire, with both her propellers fouled, was sunk by her crew close to the entrance of the canal. The Intrepid (Lieutenant Stuart S. Bonham-Carter), the second of the blocking ships, following a few minutes later, was sunk in the ship-canal itself; and the Iphigenia (Lieutenant Edward W. Billyard-Leake), the last of the three blocking ships, following close astern of the Intrepid, was sunk with the most complete success across the narrowest part of the ship-canal at 12.45 a.m.

25. It was expected that the blocking ships Brilliant (Commander Alfred E. Godsal) and Sirius (Lieutenant-Commander Henry N. M. Hardy, D.S.O.) would have found the entrance to Ostend harbour by midnight. For some reason, however, which is explained in the next paragraph, they missed their objective, ran ashore, and had both to be sunk about 12.30 a.m.

Ostend.

26. The success of the Ostend enterprise was affected to some extent by two adverse factors: (1) at 12.15 a.m. the wind (N.N.E.), which so far had been favourable for purposes of the smoke screen, shifted into an unfavourable quarter (S.S.W.), thereby exposing the attacking forces to the fire of the enemy; (2) the buoy which marks the channel to Ostend harbour had been moved very shortly before, unknown to us, to a position some 2,400 yards further east, so that when Brilliant and Sirius found it and put their helms to starboard they ran ashore.

27. The manner in which the survivors of the crews of the five blocking ships and of Submarine C3 were rescued and brought away by volunteer crews in motor launches and a picket boat was beyond praise. The various incidents are described in subsequent paragraphs.

Casualties.

28. In the course of the attack on St. George's Day our casualties to officers and men were as follows:—Killed, 176; wounded, 412; missing, 49; of the latter 35 are believed to have been killed. Although these casualties are light compared to those that the Army constantly suffers in similar enterprises, we have to mourn the loss of comrades selected from practically every unit of His Majesty's sea forces. Our losses in ships were as follows:—H.M. North Star and motor launches Nos. 424 and 110 sunk. No other vessel was rendered unfit for further service.

29. I have already submitted to the Lords Commissioners of the Admiralty the list of naval officers whom I considered deserving of promotion, either immediately or as soon as they have the prescribed service. I propose to forward as soon as possible a supplementary despatch bringing to their Lordships' notice the names of other officers and men who distinguished themselves, for they are naturally numerous. They came from many ships, and were scattered immediately the operations were over, so that it is difficult to obtain the details relating to them.

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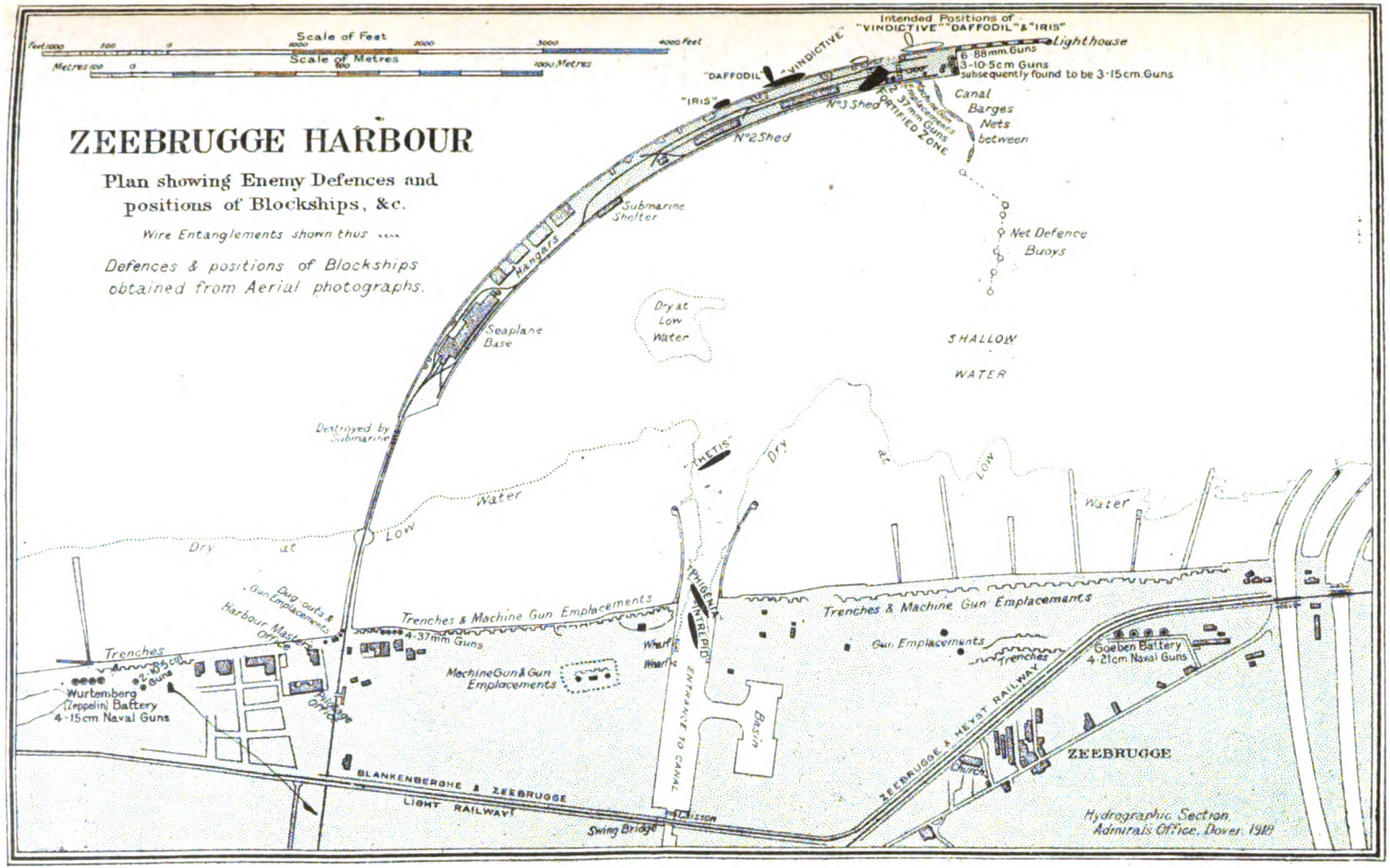

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30. I cannot close this brief summary without reference to those gallant souls who did not live to see the success of their endeavours. It seems almost invidious to mention names when every officer and man who took part was animated by one spirit, ardently welcoming the opportunity of achieving a feat of arms against odds in order that honour and merit might be added to that which our Service has gained in the past. Amongst those who lost their lives were many who shared with me the secrets of the plan, and of those I cannot refrain from recalling Lieutenant-Colonel Elliot, Captain Halahan, Commander Valentine Gibbs, Majors Cordner and Eagles, Lieutenant-Commanders Harrison and Bradford, Lieutenants Hawkings and Chamberlain, and Wing-Commander Brock, who all worked for many weeks in the training of the *personnel* and the preparation of material. Their keen enthusiasm and absolute confidence that the enterprise would be carried to a successful issue were invaluable to me. During the anxious days of waiting in crowded ships in a secluded anchorage, and in spite of two disappointments, the patience and faith that our chance would come, which were displayed by all, owed much to the fine example of these officers.

NARRATIVE.

II.—Composition of Forces.

31. In order that all parts of the Naval Service might share in the expedition, representative bodies of men were drawn from the Grand Fleet, the three Home Depôts, the Royal Marine Artillery and Light Infantry. The ships and torpedo craft were furnished by vessels from the Dover Patrol, which was reinforced by vessels from the Harwich Force and the French Navy. The Royal Australian Navy and the Admiralty Experimental Stations at Stratford and Dover were also represented.

The details thus contributed, which finally composed the whole striking force, were as shown in the following table:—

From	Monitors.	Light Cruisers.	Leaders.	T.B.D.'s	M.L.'s.	C.M.B.'s.	Picket Boats.	Parent Ships, &c.	Blocking Ships.	Submarines.	Mine-sweepers.	Auxiliary Craft.	Besides those belonging to ships in preceding columns. Offrs.	Men.
Grand Fleet (exclusive of Royal Marines)	—	—	—	—	—	—	—	—	—	—	—	—	27	365
Harwich Force:—														
Covering Squadron	—	7	2	14	—	—	—	—	—	—	—	—	—	—
For Operations	—	—	1	6	—	—	—	—	—	—	—	—	—	—
Dover Patrol	8	1	4	17	36	12	—	—	—	—	1	—	—	—
Portsmouth	—	—	—	—	10	12	—	2	1	2	—	1	9	41
The Nore	—	—	—	—	12	—	1	1	4	—	—	1	7	469
Plymouth	—	—	—	—	—	—	—	—	—	—	—	—	2	8
Royal Australian Navy	—	—	—	—	—	—	—	—	—	—	—	—	1	10
French Navy	—	—	—	8	4									
Dover Experimental Base	—	—	—	—	—	—	—	—	—	—	—	—	4	87
Royal Marine Artillery	—	—	—	—	—	—	—	—	—	—	—	—	2	58
Royal Marine Light Infantry	—	—	—	—	—	—	—	—	—	—	—	—	30	660
Total	8	8	7	45	62	24	1	3	5	2	1	2	82	1,698

III.—TRAINING OF *PERSONNEL*, PREPARATION OF MATERIAL.

32. A force thus composed and its weapons obviously needed collective training and special preparation to adapt them to their purpose.

Assembly of the forces.

32. With these objects, the Blocking Ships and the Storming Forces were assembled towards the end of February and from April 4th onwards in the West Swin Anchorage, where training specially adapted to the plan of operations was given, and where the organisation of the expedition was carried on. The material as it was prepared was used to make the training practical, and was itself tested thereby. Moreover, valuable practice was afforded by endeavours to carry out the project on two occasions on which the conditions of wind and weather compelled its postponement, and much was learnt from these temporary failures. The Hindustan, at first at Chatham and later at the Swin, was the parent ship and training depôt, and it is due to Captain A. P. Davidson, D.S.O., who also did good

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work in fitting out the various ships, that the accommodation of the assembling crews and their maintenance during the weeks of preparation and postponement was so ably organised as to reduce the discomforts inseparable from the situation to a minimum. After the second attempt, when it became apparent that there would be a long delay, the Dominion joined the Hindustan, and the pressure on the available accommodation was relieved by the transfer of about 350 seamen and marines to her.

34. Two special craft, the Liverpool ferry-steamers Iris (renamed Iris II.) and Daffodil, were selected after a long search at many ports by Captain Herbert C. J. Grant (Retired) and a representative of the Director of Dockyards, on account of their power, large carrying capacity (1,500), and shallow draft, with a view in the first place to their pushing the Vindictive alongside the Mole (for which they were in the result most useful); to the possibility, should the Vindictive be sunk, of their bringing away all her crew and the landing parties; or to their ability to manœuvre in shallow waters or clear of mine-fields or torpedoes. They proved to be admirably chosen, and rendered good service.

35. The blocking ships and Vindictive were specially prepared for their work in Chatham Dockyard, the Iris II. and Daffodil at Portsmouth. I received the most zealous and able help from all officers and Departments concerned, who did their utmost to expedite the work in every way.

Plans.

36. I was able to devote more personal attention and time to working out the plan of operations and the preparation of *personnel* and material than would otherwise have been possible, because Rear-Admiral Cecil F. Dampier, Admiral-Superintendent and second in command of the Dover Flotilla, Commodore the Hon. Algernon Boyle, C.B., M.V.O., Chief of Staff, and Captain Wilfred Tomkinson, commanding the Sixth (Dover) Flotilla of Destroyers, practically relieved me of all the routine work of the Dover base and patrol. I am greatly indebted to Admiral Dampier for his loyal co-operation in connexion with the operations. In order to bring together the number of destroyers requisite for the operation, while maintaining the work of the patrol, it was necessary to have the entire available force in running order. This called for high organisation on Captain Tomkinson's part, and was made especially difficult because the period of preparation coincided with that in which very heavy demands were suddenly made on the escort flotilla by the pressing needs of the army in France. The fact that the many additional services which the Dover Patrol was called on to carry out, in addition to its routine, were performed without deranging its working, reflects the greatest credit on Commodore Boyle, whose exceptional powers of organization have been invaluable to me.

Smoke screen.

37. Reference to Wing-Commander Brock's services during the operation will be made in connexion with the attack on the Mole, but I cannot leave this part of the subject without recording my indebtedness to him for the indispensable share he had in the operation. When, as Vice-Admiral of the Dover Patrol, I first began to prepare for this operation, it became apparent that without an effective system of smoke-screening such an attack could hardly hope to succeed. The system of making smoke previously employed in the Dover Patrol was unsuitable for a night operation, as its production generated a fierce flame, and no other means of making an effective smoke-screen was available. Wing-Commander Brock and sixty ratings were lent to my command, a factory was established in the dockyard, and he worked with great energy to obtain materials, designing and organising the means and the plans, and eventually developing the resources with which we finally set out. These were of great value even in the adverse circumstances which befell us, and I greatly deplore the loss of a man so well qualified to carry experiments in this matter further. When on the Mole he was very keen to acquire knowledge of the range-finding apparatus which might be of use to the country, and his efforts to do this were made without any regard to his personal safety, and I fear cost this very brave man and ingenious officer his life.

38. The fitting out of the motor launches and coastal motor-boats with smoke apparatus, designed by Wing-Commander Brock, was carried out at Dover, under short notice and with untiring energy, by my Flag Captain, Ralph Collins, ably assisted by Commander Hamilton Benn, Engineer Lieutenant-Commander M. G. A. Edwards, Lieutenant Commander F. C. Archer, and Mr. G. D. Smart, of H.M. Dockyard, Dover.

39. Staff-Paymaster Walter C. Northcott, R.N.R., the Naval Supply Officer at Dover, was at all times most zealous and untiring in dealing with the vast quantities of stores and munitions which had to be checked and distributed, often at very short notice.

40. The first officer who became available for a command in the blockships was Lieutenant Ivan B. Franks (Dolphin). Although suffering from the severe effects of an accident on service, his confident enthusiasm fired all who came into touch with him. He was put in charge of the early preparations of all the blockships, and

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commanded the Iphigenia in the two abandoned attempts, but to his great disappointment he was taken ill with appendicitis two days before the actual attack, and had to be sent to hospital to undergo an operation. I do not wish the good work he did, and the good example he set, to go unrecorded.

41. The flag officers of other commands who were in a position to assist me did so most generously. The Commander-in-Chief of the Grand Fleet sent me a selected body of officers and men truly representative of his command, for I understand that the whole of his command would have been equally glad to come. From the neighbouring commands at Portsmouth and the Nore, the Adjutant-General, Royal Marines, and the Depôt at Chatham, I received support and assistance, not only in ships and men, but in every possible way. The Rear-Admiral Commanding the Harwich Force spared me a flotilla leader and six destroyers, besides protecting the northern flank of the area in which I was operating.

Brigadier-General McEwan and his staff at Chatham supervised the training of the officers and men from the Grand Fleet as if for the Royal Naval Division, France. Their assistance was invaluable, and I much appreciate their whole-hearted co-operation.

Air forces. 42. I am much indebted to Brigadier-General Charles L. Lambe, C.M.G., D.S.O., commanding the 7th Brigade of the Royal Air Force, and Lieutenant-Colonel Frederick C. Halahan, M.V.O., D.S.O., in command of the Air Force under my command, for the co-operation of the 61st and 65th Wings, under Lieutenant-Colonels P. F. M. Fellowes, D.S.O., and James T. Cull, D.S.O., respectively, throughout the preparation and execution of the operations. The 65th Wing was lent for the purpose by the Field-Marshal Commander-in-Chief British Armies in France. For several weeks the 61st Wing were engaged in frequent reconnaissances, and took a large number of photographs in different conditions of tide, from which photographs, plans and models were constructed. On the first occasion of attempting the operation, the 65th Wing were already committed to their attack when I was compelled by shift of wind to withdraw the sea attack. The air attack was delivered with the greatest gallantry at a low altitude, and against a tremendous anti-aircraft defence. To the intense disappointment of the 65th Wing, mist and rain made it impossible to co-operate by repeating the aerial bombardment on the night of April 22nd-23rd, but the 61st Wing and aircraft from the Guston aerodrome at Dover escorted the main force across the North Sea.

IV.—PREPARATION AND DEFENCE OF ROUTE.

43. The preparation of the routes from the starting points of attack, by the removal of obstructions and the placing of navigational marks and those for the long-range bombardments was carried out by Captain Henry P. Douglas, borne for surveying duties on my staff, and Lieutenant-Commander Francis E. B. Haselfoot, his assistant. The completely successful manner in which this very important work was done, in circumstances of interference from the enemy and the elements, does great credit to these officers, both of whom I recommend to the favourable notice of the Lords Commissioners.

44. To afford protection at a certain point in the route, and to maintain the aids to navigation during the approach and retirement of the expedition, a force consisting of the flotilla-leader Scott and the destroyers Ulleswater, Teazer, and Stork, lent from the Harwich Force, and the light cruiser Attentive, flying the broad pennant of Commodore the Hon. Algernon D. E. H. Boyle, my Chief of Staff, was stationed there. The duties of this force were not interrupted by the enemy, but it was instrumental in controlling and directing the movements of detached craft in both directions, and relieved me of all anxiety on that score.

V.—THE PASSAGE OF THE FORCES.

45. At the moment of starting the forces were disposed thus:—

(*a.*) *In the Swin.*
For the attack on the Zeebrugge Mole: Vindictive, Iris II., and Daffodil.
To block the Bruges Canal: Thetis, Intrepid, and Iphigenia.
To block the entrance to Ostend: Sirius and Brilliant.

(*b.*) *At Dover.*
T.B.D. Warwick (flag of Vice-Admiral).
Unit L, Phœbe and North Star.
Unit M, Trident and Mansfield.
Unit F, Whirlwind and Myngs.
Unit R, Velox, Morris, Moorsom, and Melpomene.
Unit X, Tempest and Tetrarch.
To damage Zeebrugge viaduct: Submarines C. 1 and C. 3.

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A special picket boat to rescue crews of C. 1 and C. 3.
Minesweeper Lingfield to take off surplus steaming parties of blockships, which had 100 miles to steam.
Eighteen coastal motor boats, Nos. 5, 7, 15, 16, 17, 21B, 22B, 23B, 24A, 25BD, 26B, 27A, 28A, 29A, 30B, 32A, 34A, 35A.
Thirty-three motor-launches, Nos. 79, 110, 121, 128, 223, 239, 241, 257, 258, 262, 272, 280, 282, 308, 314, 345, 397, 416, 420, 422, 424, 513, 525, 526, 533, 549, 552, 555, 557, 558, 560, 561, 562.
To bombard vicinity of Zeebrugge: Monitors Erebus and Terror.
To attend on monitors, &c.: Termagant, Truculent, and Manly.
Outer patrol off Zeebrugge: Attentive, Scott, Ullswater, Teazer, and Stork.

(c.) *At Dunkirk.*

Monitors for bombarding Ostend: Marshal Soult, Lord Clive, Prince Eugene, General Craufurd, M. 24 and M. 26.
For operating off Ostend: Swift, Faulknor, Matchless, Mastiff, and Afridi.
The British destroyers Mentor, Lightfoot, Zubian, and French torpedo-boats Lestin, Capitaine Mehl, Francis Garnier, Roux, and Bouclier, to accompany the monitors.
Eighteen British motor launches, Nos. 11, 16, 17, 22, 23, 30, 60, 105, 254, 274, 276, 279, 283, 429, 512, 532, 551, 556, engaged in smoke-screening duty inshore and rescue work, and six for attending on big monitors.
Four French motor launches, Nos. 1, 2, 33, and 34, attending on M. 24 and M. 26.
Coastal motor boats (40 feet), Nos. 2, 4, 10, and 12; (55 feet) 19 and 20.

46. Navigational aids having been established on the route, the forces from the Swin and Dover were directed to join my flag off the Goodwin Sands and proceed in company to a rendezvous, and thereafter as requisite to their respective stations; those from Dunkirk were given their orders by the Commodore.

47. An operation time-table was issued to govern the movements of all the forces, wireless signals were prohibited, visual signals of every sort were reduced to a minimum, and manœuvring pre-arranged as far as foresight could provide. With few and slight delays the programme for the passage was carried out as laid down, the special aids to navigation being found of great assistance.

48. The Harwich Force, under Rear-Admiral Sir Reginald Tyrwhitt, K.C.B., D.S.O., was posted to cover the operation and prevent interference from the northward, which relieved me of all concern on that score. Covering forces.

49. On leaving the Goodwins, the Main Force was disposed in three columns. The centre column was led by Vindictive, with Iris II. and Daffodil in tow, followed by the five blocking ships and the paddle mine-sweeper Lingfield, escorting five motor launches for taking off the surplus steaming parties of the blocking ships. The starboard column was led by the Warwick, flying my flag, followed by the Phœbe and the North Star, which three ships were to cover the Vindictive from torpedo attack while the storming operations were in progress; Trident and Mansfield, towing submarines C. 3 and C. 1; and Tempest to escort the two Ostend blockships. The port column was led by Whirlwind, followed by Myngs and Moorsom, which ships were to patrol to the northward of Zeebrugge; and the Tetrarch, also to escort the Ostend blockships. Every craft was towing one or more coastal motor boats, and between the columns were motor launches.

50. The greater part of the passage had to be carried out in broad daylight, with the consequent likelihood of discovery by enemy aircraft or submarine. The risk was largely countered by the escort of all the scouting aircraft under my command. On arrival at a certain position (C), it being then apparent that the conditions were favourable, and that there was every prospect of carrying through the enterprise up to programme time, a short pre-arranged wireless signal was made to the detached forces that the programme would be adhered to.

51. On arrival at a position 1½ miles short of (G), at which Commodore Boyle's force was stationed, the whole force stopped for 15 minutes to enable the surplus steaming parties of the blockships to be disembarked and the coastal motor boats slipped. These and the motor launches then proceeded in execution of previous orders. On resuming the course the Warwick and Whirlwind, followed by the destroyers, drew ahead on either bow to clear the passage of enemy outpost vessels.

52. When the Vindictive arrived at a position where it was necessary for her to alter course for the Mole, the Warwick, Phœbe, and North Star swung to starboard and cruised in the vicinity of the Mole until the final withdrawal of all the attacking forces. During this movement and throughout the subsequent operations Warwick was manœuvred to place smoke screens wherever they seemed to be most required, and when the wind shifted from north-east to south-west, her services in this respect were particularly valuable.

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VI. BOMBARDING FORCES.

Monitors.

53. *Zeebrugge.*—The monitors Erebus (Captain Charles S. Wills, C.M.G., D.S.O.) and Terror (Captain Charles W. Bruton), with the Destroyers Termagant, Truculent, and Manly, were stationed at a position suitable for the long-range bombardment of Zeebrugge in co-operation with the attack. Owing to poor visibility and an extraordinary set of the tide the opening of bombardment was delayed slightly behind programme time; otherwise the operations of this force were carried out according to plan. During the operation enemy shell fell in the vicinity of Erebus and Terror, but neither was hit. On completion of the bombardment the vessels of this force took up patrolling positions to cover the retirement from Zeebrugge. Aerial photographs show the good effect of this bombardment.

54. *Ostend.*—Similarly, the monitors Marshal Soult (Captain George R. B. Blount, D.S.O.), General Craufurd (Commander Edward Altham), Prince Eugene (Captain Ernest Wigram, D.S.O.), and Lord Clive (Commander Reginald J. N. Watson, D.S.O.), and the small monitors M. 21 (Commander Oliver M. F. Stokes), M. 24 (Acting Commander Claude P. C. de Crespigny, and M. 26 (Lieutenant-Commander Arthur C. Fawssett) were stationed by Commodore Hubert Lynes, C.M.G., in suitable positions to bombard specified batteries. These craft were attended by the British destroyers Mentor, Lightfoot, and Zubian, and the French Capitaine Mehl, Francis Garnier, Roux, and Bouclier. The Commodore reports that the bombardment was undoubtedly useful in keeping down the fire of the shore batteries. These returned the monitors' fire about five minutes after the latter opened, the ships being hit by fragments of shell, but no material damage being done.

55. *Siege Guns.*—Co-operation by R.M.A. siege guns (Colonel Pryce Peacock, R.M.A.) on given enemy targets was arranged by the Commodore Dunkirk, to which the enemy replied without causing any casualties or any damage of importance.

VII.—ATTACK ON ZEEBRUGGE MOLE.

Vindictive and submarines.

56. *General.*—The attack on the Mole was primarily intended to distract the enemy's attention from the ships engaged in blocking the Bruges Canal, its immediate objectives were, firstly, the capture of the 4·1 inch battery at the sea end of the Mole [NOTE.—After the evacuation of Zeebrugge by the enemy it was found that these guns were of 5·9 inch calibre, and subsequent to these operations the battery was moved from the end of the Mole on to the parapet, which was a serious menace to the passage of the block-ships, and, secondly, the doing of as much damage to the material on the Mole as time permitted, for it was not the intention to remain on the Mole after the primary object of the expedition had been accomplished.

The attack was to consist of two parts: (*a*) the landing and storming and demolition parties, and (*b*) the destruction of the iron viaduct between the shore and the stone Mole.

57. The units detailed for the attack were:—

(*a*) H.M. Ship Vindictive, Acting Captain Alfred F. B. Carpenter (late Emperor of India); the special steamers Iris II., Commander Valentine Gibbs (Tiger), and Daffodil, Lieutenant Harold G. Campbell (Emperor of India); the latter detailed to push the Vindictive alongside the Mole and keep her there as long as might be requisite.

(*b*) Submarines C 3 and C 1, commanded by Lieutenants Richard D. Sandford and Aubrey C. Newbold respectively, attended by a picket boat under Lieutenant-Commander Francis H. Sandford, D.S.O.

58. Besides the above, a flotilla of twenty-four motor launches and eight coastal motor boats were told off for rescue work and to make smoke screens or lay smoke floats, and nine more coastal motor boats to attack the Mole and enemy vessels inside it, &c.

At 11.40 p.m., the coastal motor boats detailed to lay the first smoke screen ran in to a very close range and proceeded to lay smoke floats and by other methods produce the necessary "fog." These craft came under heavy fire, and only their small size and great speed saved them from destruction.

59. Vindictive.—At 11.30 p.m. the Blakenberghe light buoy was abeam, and the enemy had presumably heard or seen the approaching forces, as many star shells were fired, lighting up the vicinity, but no enemy patrol craft was sighted. At this time the wind, which had been from the north-east, and therefore favourable to the success of the smoke screens, died away, and at a later period came from a southerly direction. Many of the smoke floats laid just off the Mole extension were sunk by enemy fire, and this in conjunction with the changes in the wind lessened the effectiveness of the smoke screen.

60. At 11.56 the ship having just passed through a smoke screen, the Mole extension was seen in the semi-darkness about 300 yards off on the port bow. Speed was increased to full, and course altered so that allowing for cross tide the ship would

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make good a closing course of 45 degrees to the Mole. The Vindictive purposely withheld her fire to avoid being discovered, but almost at the moment of her emerging from the smoke the enemy opened fire. So promptly, under the orders of Commander Edward, O. B. S. Osborne, was this replied to by the port 6-in. battery, the upper deck pom-poms, and the gun in the fore-top, that the firing on both sides appeared to be almost simultaneous. Captain Carpenter was conning the ship from the port forward flame-thrower hut. Lieutenant-Commander Robert B. Rosoman, with directions as to the handling of the ship should the captain be disabled, was in the conning tower from which the ship was being steered.

Vindictive at the Mole.

61. At one minute after midnight on April 23rd, St. George's Day the programme time being midnight—the Vindictive was put alongside the Mole, taking gently on the special fenders of the port bow, and the starboard anchor was let go. At this time the noise was terrific. During the previous few minutes the ship had been hit by a large number of shell and many casualties caused. Lieutenant-Colonel Bertram H. Elliot, D.S.O., and Major Alexander A. Cordner, the two senior officers of the Royal Marine storming parties, and Captain Henry C. Halahan, D.S.O., commanding the naval storming parties, all ready to lead the men on to the Mole, had been killed; Commander Patrick H. Edwards, R.N.V.R., and many other officers and men killed or wounded.

62. As there was some doubt as to the starboard anchor having gone clear, the port anchor was dropped close to the foot of the Mole and the cable bowsed-to with less than a shackle out. A three-knot tide was running past the Mole; and the scend alongside the Mole created by the slight swell caused much movement on the ship. There was an interval of three or four minutes before the Daffodil could arrive and commence to push the Vindictive bodily alongside. During this interval the ship could not be got close enough for the special Mole anchors to hook, and it was a very trying period. Many of the brows had been broken by shell fire, and a heavy roll had broken up the foremost mole-anchor as it was being placed. The two foremost brows, however, reached the wall and the naval storming parties, led in the most gallant manner by Lieutenant-Commander Bryan F. Adams (Princess Royal) ran out along them closely followed by the Royal Marines, gallantly led by Captain and Adjutant A. R. Chater. Owing to the rolling of the ship a most disconcerting motion was imparted to the brows, the outer ends of which were "sawing" considerably on the Mole parapet. Officers and men were carrying Lewis guns, bombs, ammunition, &c., and were under heavy machine gun fire at close range, add to this a drop of thirty feet between the ship and the Mole and some idea of the conditions which had to be faced may be realized. Yet the storming of the Mole by these two brows, and later by two others which were got into position, was carried out without the smallest delay and without any apparent consideration of self-preservation. Some of the first men on the Mole did splendid work with the object of hauling one of the large mole-anchors across the parapet. Lieutenant-Commander Rosoman assisted in this on board, encouraging and directing the men with great coolness and ability.

Daffodil and Iris II.

Daffodil arrived three minutes after Vindictive, closely followed by Iris II. Both suffered less in the approach, Vindictive occupying practically all the enemy's attention. As already stated, Daffodil's primary duty was to push Vindictive bodily on to the Mole, to enable her to be secured, after which Daffodil was to come alongside and land her parties over that ship. In the end her men had to disembark from her bows on to Vindictive, as it was found essential to continue to push Vindictive on to the Mole throughout the action. This duty was magnificently carried out by her Commanding Officer, Lieutenant Harold G. Campbell (Emperor of India), who, during the greater part of the time, was suffering from a wound in the head which for the time deprived him of the sight of one eye. Without the assistance of Daffodil very few of the storming parties from Vindictive could have been landed or re-embarked; and the greatest credit is due to Mr. Campbell for the skilful manner in which he handled his ship.

63. The landing from Iris II. was even more trying. The scend alongside made her bump heavily, and rendered the use of scaling ladders very difficult, many being broken up. Lieutenant Claude E. V. Hawkings (Erin) ascended the first ladder, secured the mole anchor and was then shot and fell onto the Mole. Lieutenant-Commander George N. Bradford (Orion) got to the top of a derrick with a mole-anchor, on it, leaped on to the Mole, secured the anchor, and was shot, falling into the water between Iris II. and the Mole. Gallant attempts to recover his body were made, Petty Officer M. D. Hallihan being killed while so employed. The gallantry and devotion to duty of these two officers was of the highest order. In the end, so impossible was it to get the mole-anchors to hold, that the cable was slipped, and Iris II. went alongside Vindictive to enable D Company and her Royal Marines to land across her, but only a few men had got to the Vindictive when the withdrawal signal was sounded.

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64. On board the Vindictive the foremost 7·5-inch Howitzer's Marine crew were all killed or wounded in the very early part of the action. A naval crew from a 6-inch gun took their place, and were almost entirely wiped out. At this period the ship was being hit every few seconds, chiefly in the upper works, from which the splinters caused many casualties. It was difficult to locate the guns which were doing the most damage, but Lieutenant Charles N. B. Rigby, R.M.A., with his Royal Marines in the foretop, kept up a continuous fire with pom-poms and Lewis guns, changing rapidly from one target to another. Two heavy shells made direct hits on the foretop, killing Lieutenant Rigby and killing or disabling all in the top, except Sergeant N. A. Finch, who, though severely wounded, continued firing till the top was wrecked by another heavy shell. Captain Carpenter reports that before going into the foretop Lieutenant Rigby had displayed fine courage and ability, and that the success of the storming of the Mole was largely due to the good work of this officer and the men under his orders.

65. Acting Captain Reginald Dallas Brooks, R.M.A., was in command of the R.M.A. gun detachments in Vindictive. He not only set his men generally a splendid example of devotion to duty, but commanded the crew of the 11-inch Howitzer in its exposed position in a very fine manner.

66. Half an hour after the storming of the Mole had been commenced, the Captain visited the decks below and found Staff-Surgeon James McCutcheon and the staff under him working with great energy and care. A constant stream of casualties were being brought down every hatch, yet there appeared to be no delay in dealing with each case.

Storming and demolition forces.

67. The Mole.—The attack on the Mole was designed to be carried out by a storming force to prepare the way for, and afterwards to cover and protect, the operations of a second force which was to carry out the actual demolition, damage, etc. Both these forces comprised Royal Naval ranks and ratings under the command of Captain Henry C. Halahan, D.S.O., and Royal Marines under the command of Lieutenant-Colonel Bertram N. Elliot, D.S.O.

68. The storming force was composed of Naval Companies A. (Lieutenant-Commander Bryan F. Adams, Princess Royal), B. (Lieutenant Arthur G. B. T. Chamberlain, Neptune), and D. (Lieutenant-Commander G. N. Bradford, Orion), all under the command of Lieutenant-Commander Arthur L. Harrison (Lion), and the 4th Battalion, Royal Marines, organised as follows:—

"A" (Chatham) Company: Major Charles E. C. Eagles, D.S.O.
"B" (Portsmouth) Company: Captain Edward Bamford, D.S.O.
"C" (Plymouth) Company: Major Bernard G. Weller, D.S.O.
Machine Gun Company: Capt. Charles B. Conybeare.

On the death of Lieutenant-Colonel Elliot, D.S.O., and Major Alexander A. Cordner (Second in Command), Major Weller assumed command of the battalion. Captain A. R. Chater was battalion adjutant.

This force was embarked mainly in Vindictive, but partly in Iris II.

69. The demolition force was composed of C. Naval Company, under the command of Lieutenant Cecil C. Dickinson (Resolution), and was divided into three parties, Nos. 1 and 3, under Sub-Lieutenant Felix E. Chevallier (Iron Duke), being conveyed in the Daffodil, and No. 2, under Lieutenant Dickinson, in the Vindictive.

Preparation and training.

70. The objectives of the storming forces had been communicated to the officers, and specific duties allotted to the different units, who had been exercised on a replica of the Mole, described to the men as "a position in France."

71. This specialised preparation was necessary, but it handicapped the leaders of the storming parties, for, owing to the difficulty in recognising objects on the Mole, the Vindictive overran her station and was berthed some 400 yards further to the westward (or shore end of the Mole) than was intended (*see* plan). It was realised beforehand that Vindictive might not exactly hit off her position, but the fact that the landing was carried out in an unexpected place, combined with the heavy losses already sustained by Vindictive, seriously disorganised the attacking force. The intention was to land the storming parties right on top of the 4·1-in. guns (*see* footnote to para. 56) in position on the seaward end of the Mole, the silencing of which was of the first importance, as they menaced the approach of the blockships. The leading blockship was timed to pass the lighthouse twenty-five minutes after Vindictive came alongside. This period of time proved insufficient to organise and carry through an attack against the enemy on the seaward end of the Mole, who were able to bring heavy machine-gun fire to bear on the attacking forces. As a result the blockships came under an unexpected fire from the light guns on the Mole extension. [NOTE.—After the evacuation it was found that three of the guns on the Mole extension were of 4·1 calibre, though the 4·1-in. battery on the Mole head remained silent (*see* paragraphs 73 and 94).]

The attack.

72. Lieutenant-Commander Adams, followed by the survivors of "A" and "B" Companies, were the first to land, no enemy being then seen on the Mole. These two companies had suffered severely before landing, especially "B," both of whose

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officers were casualties. They found themselves on a pathway on the Mole parapet about 8 feet wide, with a wall 4 feet high on the seaward side, and an iron railing on the Mole side. From this pathway there was a drop of 15 feet on to the Mole proper. This raised portion of the Mole will in future be referred to as the parapet. Followed by his men, Mr. Adams went along the parapet to the left (towards the lighthouse extension), where he found a look-out station or control, with a range-finder behind and above it. A bomb was put into this station, which was found clear of men. Wing-Commander Frank A. Brock here joined the party, and went inside to investigate. He was not seen again by Mr. Adams, but from other accounts it is believed he was seen alive later.

73. Near this look-out station an iron ladder led down to the Mole, and three of Mr. Adams's party descended it and prevented a few of the enemy from reaching the harbour side of the Mole. Two destroyers alongside the Mole showed no activity up to this time, nor did Mr. Adams see the three-gun battery at the Mole end fire at any time whilst he was on the parapet, but a machine-gun about 100 yards to the westward of these guns was firing on his party. It appeared at this time that the enemy were firing at the Vindictive from the shore end of the Mole, but no gun flashes were seen, as everything was so well illuminated by enemy star shells and the rockets fired by Vindictive. After capturing the look-out station Mr. Adams advanced to the eastward about 40 yards, where he left his party in position and himself returned to collect more men.

74. Returning to the look-out station, Mr. Adams found only some wounded, but later collected two Lewis gunners and a small party under Petty Officer George E. Antell, O.N. 232364 (Lion). These he sent to the eastward and the Petty Officer inboard, as he had been wounded in the hand and arm before landing, and although in great pain had carried on most gallantly.

75. The situation now was that Mr. Adams's few men and the two Lewis gunners were beyond the look-out station protected from the machine-gun fire from the direction of the Mole Head, but exposed to that from the destroyers alongside the Mole, and the men were being hit apparently by machine-guns and pom-poms. Lieutenant-Commander Harrison arrived at this time; this gallant officer was severely wounded in the head on board Vindictive before coming alongside, but directly he recovered consciousness he joined his section on the Mole; on receiving Mr. Adams's report he directed him to try and get more men. Major Weller, Commanding the Royal Marines, on receiving Mr. Adams's report, dispatched Lieutenant G. Underhill with reinforcements to assist Mr. Harrison. Whilst this party was being collected Mr. Adams returned to the look-out station, where he was informed that Mr. Harrison had led a rush along the parapet and that he and several of his men had been killed by machine-gun fire. Able Seaman McKenzie, one of B Company's machine gunners with Mr. Harrison, did good execution with his gun, though wounded in several places, and Able Seaman Eaves [NOTE.—Able Seaman Eaves, it appears, was not killed, but was very severely wounded and taken prisoner.] was killed in attempting to bring in Mr. Harrison's body.

Recall.

76. About this time the recall was sounded, and Mr. Adams therefore withdrew his men from the parapet and Mole, collected the wounded, and sent them to the Vindictive. He himself went along the parapet in search of Mr. Harrison, but not finding him, returned to assist in the re-embarkation. As originally planned, Mr. Harrison's bluejacket storming parties were to deal with the battery on the Mole head and Mole extension only, but for the reasons given in paragraph 71 they started 400 yards further from their objectives than was intended with the intervening ground fully exposed to machine-gun fire. Mr. Adams and his men, and later Mr. Harrison, pressed their attack most gallantly, and, though denied a full measure of success, it appears probable their fire prevented the 4·1 inch battery at the Mole head coming into action, as these guns did not open fire at the blockships (see paragraph 94).

Royal Marines.

77. *Marine Storming Party.*—The Royal Marines of this expedition were drawn from the four divisional headquarters and the Grand Fleet. The battalion was to provide the officers and men of the storming force: the crews of four Stokes guns, one 11-inch howitzer, five pom-poms, and some Lewis guns of the Vindictive's armament, and a few men to work with the Naval demolition party. It was carried to Zeebrugge in the Vindictive, except A Company, two Vickers guns of the machine-gun section, and two Stokes guns, which went in Iris II. All had taken part in the special training and practices referred to, the howitzer crews having been put through a course at Shoeburyness.

78. The first objective of the Royal Marine Battalion was a fortified zone situated about 150 yards from the seaward end of the Mole proper; its capture was of the first importance, as an enemy holding it could bring a heavy fire to bear on the parties landing from Vindictive. This objective being gained, the Royal Marines were to continue down the Mole and hold a position so as to cover the

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operations of the demolition parties from an attack by enemy troops advancing from the landward end of the Mole. The destruction of the Viaduct by Submarine C. 3 was intended to assist in this, by preventing reinforcements reaching the Mole from the shore. Owing to Vindictive coming alongside to landward of this zone, the Royal Marines were faced with the double duty of preventing an enemy attack from the shore end and of themselves attacking the fortified zone. The casualties already sustained and the fact that Iris II could not remain alongside to land her company of Royal Marines (see paragraph 65) left insufficient men in the early stages of the landing to carry out both operations. The situation was a difficult one, for to attack the fortified zone first might have enabled the enemy to advance up the Mole and seize positions abreast Vindictive with the most serious consequences to the whole landing force, whereas by not attacking the fortified zone the guns at the Mole head could not be prevented from firing at the blockships. As will be seen in subsequent paragraphs, the Royal Marines first secured the landward side, after which an assault was organized against the fortified zone, but the unavoidable delay prevented this attack from being carried through before the blockships had passed in and the recall sounded. Major Weller's action was correct; lack of men prevented him reinforcing the bluejacket storming parties under Mr. Harrison and Mr. Adams, who had in consequence to attempt an assault on a very strong position with the depleted A and B Companies, and without the assistance of D Company, which could not be landed in time from Iris II (see paragraph 63). How heroically they failed has been related in paragraphs 72 to 75.

79. No. 5 Platoon (Lieutenant T. F. V. Cooke) was the first to land, and proceeded to the right (west) along the parapet. They silenced a party of snipers who were firing from near No. 2 Shed into the men landing. Captain and Adjt. A. R. Chater initiated this, which Major Weller considers greatly assisted the disembarkation. Captain Bamford now joined, and with Lieutenant Cooke and this platoon reached a position some 200 yards from the Vindictive; their action greatly assisted the advance along the Mole, they themselves being exposed to a galling fire. Lieutenant Cooke, who set a fine example, was twice wounded, and was rendered unconscious; he was most gallantly carried back to the Vindictive by Private John D. L. Prees, R.M.L.I., who was himself wounded.

80. No. 9 Platoon and the remnants of No. 10, under Lieutenant C. D. R. Lamplough, were the next to land. They descended from the parapet to the Mole (a drop of 15 feet) by means of ropes, and proceeded to establish a strong point at the shoreward end of No. 3 Shed, to prevent possible attack from that direction. This unit later attacked a destroyer alongside the Mole, inflicting damage on the craft and crew.

81. Units were now rapidly landing, and No. 7 Platoon (Lieutenant H. A. P. de Berry) succeeded in placing their heavy scaling ladders in position, and then formed up to support Nos. 9 and 10 Platoons. The successful placing of the scaling ladders was largely due to Sergeant-Major C. J. Thatcher. Major Weller then received information that the naval storming party needed reinforcements. He therefore dispatched No. 12 Platoon and the remnants of No. 11, under Lieutenant G. Underhill, to their assistance. These platoons advanced to the left (east) along the parapet, and reached the look-out station, where they were checked by machine-gun fire; Mr. Adams and his men were some 40 to 50 yards ahead of them, and both parties could make no headway along the exposed parapet. Meanwhile No. 5 Platoon, which had been recalled from its advanced position, with Nos. 7 and 8 Platoons, all under Captain Bamford, were forming up on the Mole for an assault on the fortified zone and the 4·1 inch battery at the Mole head. This attack was launched, but before it could be developed the general recall was sounded. The units fell back in good order, bringing their wounded with them. The passing of the men from the Mole on to the parapet by means of the scaling ladders was rendered hazardous by the enemy opening fire at that portion of the Mole, several ladders being destroyed; the men were sent across in small batches from the comparative shelter afforded by No. 3 Shed, such rushes taking place as far as possible in the intervals between the enemy's bursts of fire.

82. *The Demolition or C Company.*—This company was under the orders of Lieutenant Cecil C. Dickinson (Resolution), and was divided into three parties, Nos. 1 and 3 consisting of Sub-Lieutenant Felix E. Chevallier (Iron Duke) and twenty-nine ratings in the Daffodil, and No. 2 of Lieutenant Dickinson and twenty-one ratings in the Vindictive. Twenty-two rank and file R.M.L.I. were attached for the transport of the explosive equipment.

83. Lieutenant Dickinson and No. 2 party landed after the Naval Storming Parties and assembled on the pathway of the parapet, which became somewhat crowded before the scaling ladders could be got into position to enable the men to descend on to the Mole. No. 2 party then proceeded to No. 3 Shed. The heavy fire from the destroyers alongside the Mole prevented any advance towards the

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shore, and the demolition of this shed was therefore impracticable; charges were however, placed and everything prepared in case an opportunity for its destruction occurred. An attempt was made to place a charge alongside the destroyers, but was repulsed by their fire. Some bombs were therefore thrown on board. The enemy's shell fire at this portion of the Mole became very heavy, and the recall being sounded the party re-embarked under the conditions related in paragraph 81.

Demolition party.

84. The demolition party was on the Mole about 55 minutes, and it was solely on account of the proximity of our own storming parties that no destruction took place. This party, ably led by Lieutenant Dickinson, behaved in a most cool and undisturbed manner, both during the approach (when they suffered severely) and on the Mole. After returning on board the extra explosives, &c., were jettisoned, as they were then only a danger to the ship. The preparation of the demolition scheme and organization of the company for carrying it out was very efficiently planned by Lieutenant-Commander Francis H. Sandford, D.S.O., borne for special service on my Staff.

85. *Experimental Party.*—The account of the attack on the Mole would not be complete without reference to the contribution in officers and men made by a detachment from the Admiralty Experimental Station at Stratford, and the work done by them. This detachment was commanded by Lieutenant Graham S. Hewitt, R.N.V.R., with Lieutenant A. L. Eastlake, R.E., second-in-command. It contributed thirty-four men, all volunteers, for the working of the fixed and portable flame-throwers, phosphorus grenades, &c., either on board Vindictive, Iris II, and Daffodil, or with the various naval and marine parties landed on the Mole. The fixed flame-throwers in Vindictive were put out of action by enemy shell-fire. The portable ones accompanied the seamen and marine landing parties, the *personnel* of the experimental party sharing the difficulties and dangers of the assault. Lieutenant Hewitt specially mentions Air-Mechanics W. H. Gough and W. G. Ryan for good service during the attack on the Mole.

86. *Destruction of Viaduct.*—The object of this part of the attack on the Mole was to prevent reinforcements from the land passing on to the Mole during the operations. It was proposed to do this by exploding one or two old submarines in contact with the iron piers and cross-ties of the viaduct. It was calculated that a C class submarine at a speed of 6 knots would penetrate the light bracing of the piers up to her conning tower.

87. To enable the submarine to be abandoned and continue her course automatically, C 1 and C 3 were fitted with gyro-control. A picket boat was provided for the escape of the crew, and each submarine had two motor skiffs, they also carried a light scaling ladder each, so that in case all other means of rescue failed they might climb on the viaduct and escape along it from the effects of the explosion. Exploding charges, primers, battery and switch gear were devised and fitted. These three craft were towed by T.B.D.'s Trident and Mansfield to certain positions, whence they proceeded under their own power.

Submarine at the viaduct.

88. Submarine C 3 (Lieutenant Richard D. Sandford) proceeded on the courses laid down, and duly sighted the viaduct right ahead, distance about a mile and a half. Shortly after this, by the light of star shell, fire was opened on C 3, apparently from 4-inch guns, but was not long maintained. When the viaduct was about half a mile off, a flare on the far side silhouetted the Mole and viaduct, which appeared about two points on the port bow. Two searchlights were then switched on to C 3, and off again, possibly in order that the submarine might run into the viaduct and be caught. By this time the viaduct was clearly visible. One hundred yards away, course was altered to ensure striking the viaduct exactly at-right angles. C 3 struck exactly between two rows of piers at a speed of nine and a half knots, riding up on to the horizontal girders of the viaduct, and raising the hull bodily about two feet she penetrated up to the conning tower.

89. The crew having mustered on deck before the collision, lowered and manned the skiff. The fuses were then ignited, and the submarine abandoned, the skiff's course being set to the westward against the current. Her propeller having been damaged, oars had to be used. Immediately the skiff left the submarine, the two searchlights were switched on, and fire was opened with machine guns, rifles, and pom-poms, the viaduct being lined with riflemen firing under the wind-screen, and the houses on the inner end of the Mole opening on her with pom-poms. The boat was holed many times, but was kept afloat by special pumps which had been fitted. Mr. Sandford (twice) and two of the crew were wounded at this time. As only slow progress could be made against the current, the charge exploded when the skiff was but two or three hundred yards from the viaduct. The explosion appeared to have great effect, much *débris* falling into the water around. Both searchlights immediately went out, and firing became spasmodic. The picket boat was then sighted, and the skiff's crew taken on board, the wounded being finally transferred to the T.B.D. Phœbe. Mr. Sandford describes the behaviour of all his crew as splendid, and

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worthy of the high traditions of the submarine service. He selects his next in command, Lieutenant John H. Price, D.S.C., R.N.R., for mention, and states that his assistance was invaluable, and his conduct in a position of extreme danger exemplary. To this modest praise of the exploit, I would add that the officers and men, who eagerly undertook such hazards, are deserving of their Lordships' highest recognition. They were all well aware that if their means of rescue failed them, as through untoward circumstances it nearly did, and they had been in the water at the moment of the explosion, they must almost inevitably have been stunned and drowned, or killed outright, by the force of such an explosion. Yet they disdained to use the gyro-steering, which would have enabled them to abandon the submarine at a safe distance, and preferred to make sure, as far as was humanly possible, of the accomplishment of their duty.

90. Submarine C 1 (Lieutenant Aubrey C. Newbold), owing to delay caused by the parting of the tow, did not arrive in the vicinity of the viaduct till the retirement had commenced. He had previously seen a big flash, but had not heard any sound, and was therefore in doubt as to what the force in general had done, but realised that his boat might be required for another occasion. He therefore retired, though he and his crew immediately volunteered for similar service. They were naturally disappointed, but in my opinion Lieutenant Newbold was perfectly right, and their Lordships will not lose sight of the fact that they, equally with the officers and men of C 3, eagerly embarked on the enterprise in full realisation of what the consequences might well be.

91. The picket boat employed for rescuing the crew of C. 3 was commanded by Lieutenant-Commander Francis H. Sandford, D.S.O., who had organized the method of attack on the viaduct. The picket boat displayed bad qualities when towed above a certain speed in the prevailing conditions of wind and sea. She was steered only with great difficulty, and was twice on her beam ends, being saved from total capsize by the tow parting. She then proceeded under her own steam, and endeavoured to reached the viaduct before the explosion. Her speed was not as much as was expected; still she arrived in time to pick up the motor-skiff very shortly after the explosion, and transferred the officers and men to the Phœbe. This boat subsequently returned to Dover under her own steam, as her fore compartment being holed and full of water made towing inadvisable. From first to last she had made a voyage of 170 miles to and from the Belgian coast in unpleasant conditions, and effected the rescue in the face of almost insurmountable difficulties, due to enemy action, weather and tide. I have already recommended Lieutenant-Commander Francis Sandford for promotion on this and previous grounds. His boat's crew were all volunteers, and I am including them in my general list of recommendations to their Lordships' notice.

VIII.—BLOCKING OPERATIONS.

Bruges Canal.

92. The blocking of the Bruges Canal and the entrance to Ostend Harbour was the principal part of the whole objective, the damage to the Zeebrugge Mole being subsidiary thereto. To the Intrepid, Iphigenia, and Thetis was assigned the duty in the Bruges Canal; Brilliant and Sirius being detailed for Ostend.

93. *Zeebrugge.*—The orders to the blockships were to proceed into the canal. If her two consorts were seen to be following, the leading vessel (Thetis) was to ram the lock gates; the second and third (Intrepid and Iphigenia) were to be run ashore near the entrance at the southern end of the piers, this being the narrowest part of the channel and the position best calculated to block the channel by silt. This opinion as to the best position was based on local knowledge, and the decision to attempt the project in this way was come to after much consideration, and bearing in mind the fact that if the leading vessel should fail to block the lock gates, and should sink in the channel short of the gates, she would have been no obstruction; whereas two ships well athwart the channel at the entrance would be certain to set up silt and cause great inconvenience to the enemy.

Blocking ships at work.

94. The proceedings of these ships were as follows:—

Thetis (Commander Ralph S. Sneyd, D.S.O.).—Sighted the Zeebrugge Mole ahead, and signalled the fact to the ships astern. She was greatly assisted by rockets fired from Vindictive, which showed up the Mole extension and the light-house, and also by Captain Ralph Collins in a motor launch, who hailed the Thetis and gave her the bearing of the lighthouse. After rounding the latter the barge-boom came into view, and Thetis was steered for the barge furthest from the Mole, opening fire at the lighthouse, and then at the barge, which is reported from subsequent observation to have been sunk. The ship was under a fairly heavy fire from the light guns on the Mole extension, but her captain did not see any firing from the 4·1 in. battery at the Mole head. As the ship approached what appeared to be an opening between the barges and the net obstruction extending to the south-eastward from them she commenced to swing to port. She was given full port helm, but ran

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into the nets between the two end buoys, and continuing to forge ahead, took the nets with her. The piers of the canal entrance were in sight when both engines were reported to have brought up. Thetis had thus cleared the net obstruction away enough to enable the ships following to pass to starboard of her, and she signalled to them to do so. Being then about 300 yards from the eastern pier-head, and having drifted slightly to port (shoreward), she appears to have grounded. She had a list to starboard, and was settling down, having been frequently holed along the starboard side by gunfire. She continued to be hit from the Mole, from craft alongside it, and from guns on shore east of the canal. One or two machine guns were also firing at the ship, her 6-inch forecastle gun engaging these guns until her own smoke made it impossible to see. Communication with the engine-room having broken down, a messenger was sent, and Engineer Lieutenant-Commander Ronald C. Boddie (Hercules) succeeded in starting the starboard engine, which moved the ship ahead; and being still aground aft, her head swung to starboard into the dredged channel. As she appeared to be sinking, the commander cleared the boiler rooms, sent the boat-keepers to their boats, ordered the smoke to be turned on and the ship to be abandoned. Owing to the death of the petty officer in charge of them, the foreward firing keys were not in position; smoke and shell fumes prevented their being found, so that the charges were fired by the after keys; they detonated well, and the ship then quickly sank. The ship's company manned the one remaining cutter and pulled to M.L. 526 (Lieutenant Hugh A. Littleton, R.N.V.R.), which was lying near. Although crowded and holed in two or three places, the cutter was got away without confusion, due to the exertions of Lieutenant George A. Belben (Penelope), Commander Sneyd, and Lieutenant Francis J. Lambert (Sir John Moore) being at this time disabled by gas.

95. Intrepid (Lieutenant Stuart S. Bonham-Carter, Emperor of India).—This ship had been unable to get rid of her spare watch of stokers, owing at first to the delay in her motor launch getting alongside, and apparently to the disinclination of the surplus crew to miss the coming fight. She therefore proceeded to the canal with eighty-seven officers and men on board instead of fifty-four. On approaching the Mole she came under heavy shrapnel fire. She rounded the lighthouse and, directed by Thetis, aground on her port hand, steered for the canal, very few enemy guns firing at her, as they were concentrated on the Mole—doubtless at Vindictive—and on Thetis. On reaching his position in the canal, Lieutenant Bonham-Carter went full speed ahead with the starboard engine and full speed astern with port helm hard-a-starboard. He then waited for the crew to get into the boats, but finding the ship was making stern way he had to blow the sinking charges before the steaming party could get out of the engine-room. Engineer Sub-Lieutenant Edgar V. Meikle, with his men, got into a cutter, of which he took charge, proceeding out past the Thetis till picked up by motor launch. Another cutter was picked up by the T.B.D. Whirlwind, and the skiff by M.L. 282. With the two officers and four petty officers Lieutenant Bonham-Carter launched a Carley raft and went down the canal until picked up by motor launch 282. This motor launch came right into the canal under the stern of the Iphigenia—the next blocking ship—under a heavy fire. She was commanded by Lieutenant Percy T. Dean, R.N.V.R., whose conduct Lieutenant Bonham-Carter describes as "simply magnificent." I have had the pleasure of recommending this officer to their Lordships for promotion, and I consider his gallant conduct is well worthy of the Victoria Cross. With the exception of Stoker Petty Officer Harold L. Palliser (C.N. 226201) who was killed while in the motor launch by a machine gun, the whole crew got away. Lieutenant Bonham-Carter reports the exceptionally fine behaviour of the whole of his crew—deck and engine-room alike—and specially mentions Lieutenant Alan Cory-Wright (Ramillies), Sub-Lieutenant Dudley A. Babb (Sarpedon), and Engineer Sub-Lieutenant Meikle. In another letter I have recommended Lieutenant Bonham-Carter and the two last-named officers for promotion. I may say here that I regarded the chances of escape from any of the blocking ships as very slender, and this was well known to those who so readily volunteered for this hazardous service and to the volunteer crews of the motor launches, who ran equal risks in their work of rescue.

96. *Iphigenia* (Lieutenant Edward W. Billyard-Leake, Fearless).—This ship, like the preceding one, did not discharge all her engine-room ratings, because some managed to avoid it in order to take part in the fight, and they therefore joined up with the rest of the crew. The Iphigenia was the third and last of the Zeebrugge blockers to undertake her duty, and it is no disparagement to the predecessors, who made her task the easier by their example, to say that she was, as I believe, completely successful. On approaching the Mole, she came under shrapnel fire, and was lighted up by two searchlights on the western (or land) end of the Mole, and by flares, these latter being rendered useless to the enemy by the smoke-screen, and facilitating navigation for the attacker. On rounding the lighthouse the Iphigenia went full speed, a star shell showing up the Intrepid headed for the canal and the

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Thetis aground. As she approached Thetis that ship showed a green light on her starboard side, which enabled Lieutenant Billyard-Leake to find the canal entrance. The ship was now hit twice on the starboard side, one shell cutting the siren steam-pipe and enveloping the fore part of the ship in steam.

97. As Iphigenia approached the canal entrance it became obscured by smoke, and her captain found that she was heading for the western pier. Going full speed astern he brought his ship in between a dredger and a barge, severing them. He then went ahead with his starboard engine and drove the barge into the canal. When clear of the barge he went ahead with both engines. Seeing that the Intrepid had grounded on the western bank of the canal, with a gap between her and the eastern bank, he steered to close the gap, and collided with the port bow of Intrepid. He then rang the alarm gong to signify the imminent blowing of the sinking charges, but finding he was not completely blocking the channel he telegraphed to the engine-room to go astern, which was done. As soon as his ship was clear he sent Lieutenant Philip E. Vaux (Marvel), the First Lieutenant, to the engine-room with an order to go ahead, which was promptly obeyed. The entire entrance was then covered in smoke. As soon as he considered the ship had headway, he put the port engine astern, the starboard ahead, and his helm hard-a-starboard, and grounded on the eastern bank. He then abandoned ship and fired his charges, which all exploded. The company left the ship in one cutter, as the other one was badly damaged. While in the cutter the crew came under more shrapnel and machine-gun fire, which caused some casualties. When trying to pull clear of the ship M.L. 282 (Lieutenant Percy T. Dean, R.N.V.R., whose conduct in rescuing the officers and men from the Intrepid has already been described) was sighted across the Iphigenia's bows, and the cutter pulled to her. The majority of the crew got into the motor launch, which then went astern. The cutter also pulled round the stern of the ship and the launch took the rest on board, except three, one of whom was killed. The cutter was made fast to the stem of the motor launch, which went out of the harbour stern first at full speed. Lieutenant Billyard-Leake reports that this motor launch was entirely responsible for saving the survivors from the Iphigenia. Heavy machine-gun fire was concentrated on her while on passage out, at which time Sub-Lieutenant Maurice C. H. Lloyd, D.S.C. (Dominion), was mortally and Lieutenant James C. Keith Wright, R.N.V.R., of M.L. 416, dangerously wounded, and two of the motor launch's crew of four killed. I trust that the Lords Commissioners, who have so many claims to judge, will consider that this recital of the part played by the Iphigenia well justifies my mention of Lieutenant Billyard-Leake and of Mate (E) Sydney Greville West (Benbow), who throughout the preparations and operation worked his department in an admirable manner.

Ostend attempt.

98. *Brilliant and Sirius.*—I regret that the effort to block Ostend did not succeed. The Brilliant (Commander Alfred E. Godsal, Centurion), with Sirius (Lieut.-Commander Henry N. M. Hardy, D.S.O., Patrol) in her wake, was approaching the charted position of the Stroom Bank Buoy, but did not sight it as expected. Deducing from the position of other navigation marks already passed that the ships were to the northward of their supposed position, they continued on their original course for an extra two minutes, sighting the buoy to the north-eastward. They steered to pass to the northward of the buoy, at which time they first came under the fire from the enemy's batteries, and then shaped a course for the deduced position of Ostend. No marks were visible owing to smoke, which made it necessary for Sirius to keep very close station on Brilliant. When the Ostend Piers should have been seen by Brilliant, breakers were observed on the starboard bow, and though the helm was starboarded, the ship grounded. Sirius, observing this, immediately put her helm hard over and her engines full speed astern, but the ship being already badly damaged by gunfire and sinking, did not answer the helm, and collided with the port quarter of the Brilliant. In the end, both ships being practically fast ashore, Brilliant, with her port engine immovable, and Sirius, in sinking condition, were blown up where they stranded, as observation has since shown, about 2,400 yards east of the canal entrance. Lieutenant A. C. Crutchley (Centurion), Sub-Lieutenant Angus H. Maclachlan (Temeraire), and Engineer Lieutenant Wilfrid Long (Dublin), all serving in the Brilliant, were reported by their captain as having set a fine example to their men. Commander Godsal also mentions Petty Officer Joseph J. Reed (O.N. C230360), who behaved with conspicuous coolness.

99. The rescue of the crews by motor launches which had been standing by under heavy fire of every calibre, was carried out in the gallant manner which distinguished the work of the crews of the motor launches and coastal motor boats throughout the action. Commander Ion Hamilton Benn, R.N.V.R., attempted to go alongside in Motor Launch No. 532, but owing to thick smoke she was damaged by collision with the ship. Lieutenant Roland Bourke, R.N.V.R., in M.L. 276, repeatedly went alongside Brilliant in the difficult circumstances of her starboard engines still going astern, while M.L. 283, under the command of Lieutenant Keith R. Hoare, D.S.C., R.N.V.R.,

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embarked practically all the men from the Sirius, and sixteen from the Brilliant's whaler, sunk by gunfire.

100. After leaving the Sirius, Lieut.-Commander Hardy found that Engineer Lieutenant William R. Maclaren (Iron Duke) and some men were missing. He therefore hailed C.M.B. 10 (Sub-Lieutenant Peter B. Clarke, R.N.R.), and with Lieutenant L. Berthon, D.S.C. (Viceroy), went alongside the ship under a heavy and accurate fire from 4·1 inch and machine-guns to search for them, but found no sign of life in either ship. The officer and men were subsequently picked up by the Attentive in a boat, in which they had pulled thirteen miles out to sea after the sinking of their ship.

101. Their Lordships will share with me and the commanding officers of these ships the disappointment due to the defeat of our plans, as we may believe, by the legitimate ruse of the enemy in shifting the buoy. As the Commodore at Dunkirk remarks in the dispatch to which their Lordships will refer for details on this point, the location of buoys by aircraft is a high art, and can only be done with accuracy in relation to closely surrounding land or shoal features, but aerial photographs have since established the fact that had the buoy been in its original position the vessels would have made the entrance accurately.

102. Both Commander Godsal and Mr. Hardy immediately and repeatedly asked me for other ships, to be allowed to try again. They report that all their officers and Petty Officer Joseph Reed have volunteered to make another attempt, sanguine that with the experience gained it would succeed.

IX.—THE RETIREMENT.

103. The viaduct explosion having duly taken place, and the blocking ships having been seen proceeding shorewards, the main object of storming the Mole had been accomplished, and the only reason for prolonging the operation till the programme time for retirement was that of continuing the work of demolition. On the other hand, the only guns in Vindictive bearing on the Mole had been put out of action; the upper works of the ship and men in exposed positions were presenting an easy target to the shore guns, while, in view of the failure of the Mole anchors, the storming parties would be unable to embark if the Daffodil should be disabled. Captain Carpenter, regarding the Daffodil's escape up to this time as being almost a miracle, therefore decided to give the order for the retirement, and in this I consider he acted with good judgment; in fact I had given orders for the Warwick to close the Vindictive so that I might inform Captain Carpenter that I had seen the block-ships proceeding in, ascertain the conditions on the Mole, and decide on further action, when I saw that she was hauling off.

104. The searchlights, by which twenty minutes' warning was to be given, having been destroyed, as well as the Vindictive's syren, by which the executive signal was to be made, the Daffodil made the latter signal at fifty minutes past midnight, and the retirement commenced. About fifteen minutes later it was reported to the Captain that officers and men had ceased coming on board, a large number having already embarked by the same means as they had originally used for storming the Mole. To make doubly sure, Captain Carpenter waited until ten minutes past one, and after repeated assurances from officers and his own observation that no more were returning, he ordered Daffodil to tow Vindictive's bow away from the Mole, the port cable was slipped, and towing commenced. The hawser parted almost at once, but the ship's head was clear enough to allow her to proceed at full speed with helm hard-a-port under cover of her own smoke screen. A large bumpkin, made of her own mainmast, rigged out over the Vindictive's port quarter, and taking against the wall, protected the port screw, which nevertheless hung up two or three times, being probably fouled by the *débris* of the brows. The Vindictive reached Dover soon after 8 a.m. on the 23rd.

105. Some of the proceedings of Iris II. have been reported in connexion with the storming of the Mole, and the rest may be told here. Shortly after leaving the Mole she came under a very heavy fire from the Mole and shore batteries, being hit ten times by small shell and twice by large ones. The first large shell came through the port control position and carried away the port side of the bridge, causing a very serious fire amongst the ammunition and bombs under the bridge. It mortally wounded Commander Valentine Gibbs and Major Charles E. C. Eagles, D.S.O., R.M., and seriously wounded Lieutenant George Spencer, D.S.C., R.N.R. Lieutenant Oscar Henderson (P. 19) took a volunteer fire party with a hose on to the upper deck to quench the fire, but seeing the condition of the bridge he ran up to it and found Commander Gibbs, as he then thought, dead, and Lieutenant Spencer seriously wounded, but still conning the ship. He took command and steadied the ship on her course, the coxswain, Petty Officer David P. Smith, sticking to his post with great gallantry, steering with one hand while holding an electric torch to the

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compass with the other; it is due to Lieutenant Spencer that the ship was turned away from the land. Iris II. was again hit by three shells simultaneously, and as the men were packed very closely on the main deck the casualties were very heavy. When the ship was steadied on her course the fire was put out, Able Seaman F. E. M. Lake (Monarch) being the first man to attack it, which he did with sand, afterwards helping Mr. Henderson to throw bombs overboard, regardless of his own life. A motor launch, No. 558, commanded by Lieutenant-Commander Lionel S. Chappel, D.S.C., R.N.V.R., and with Captain Ralph Collins on board, gallantly came into the heavy fire from the enemy's guns, and throwing a smoke screen around Iris II. enabled her to get clear, the ship being very badly damaged; she reached Dover at 2.45 p.m., some five hours after the death of her captain, who remained confident and cheerful until his very heroic spirit passed.

106. Although the Lords Commissioners of the Admiralty have most promptly recognised and rewarded the services of Acting Captain Carpenter by promoting him to the Post List, I should not like to end this part of my despatch without putting on record the praise which is due to him. An excellent staff officer, he rendered me invaluable assistance in the drawing up of the final operation orders, the preparations for which involved strenuous work by many officers and a vast amount of necessary detail. My account of the proceedings of the Vindictive outlines his personal share in the attack, but as showing the force which his example had on those under his command, I hear on all sides that the Captain's calm composure when navigating mined waters and bringing his ship alongside the Mole in darkness, and his great bravery when the ship came under heavy fire did much to encourage similar behaviour on the part of the crew, and thereby contributed greatly to the success of the operation.

X.—OSTEND.

107. In arranging the sections of this despatch I have grouped proceedings of units taking part in the operations off Ostend in their appropriate places, but I submit herewith the report by Commodore Hubert Lynes, C.M.G., Senior Naval Officer at Dunkirk, to whom I am indebted for whole-hearted co-operation and loyal assistance at all times. I share his regret as to the alteration by the enemy of the position of the Stroom Bank Buoy not having been discovered, but I feel that the consequence must be accepted as one of the misfortunes of war.

108. The Lords Commissioners will notice that five French torpedo craft co-operated at Ostend with our big monitors, and four French motor launches with our small monitors. I should like to be allowed to express my gratification at this co-operation, and my thanks for the valuable assistance these vessels gave are due to Vice-Admiral Pierre Alexis, M. A. Ronarc'h, K.C.B., C.M.G., Commandant Superieur de la Marine dans la zone des Armées du Nord, Dunkerque, and to Capitaine de Vaisseau Breart de Boisanger, D.S.O.

109. Commodore Lynes has recommended for special recognition several officers and men, and the rest their Lordships will have an opportunity of considering in the list which I am forwarding as soon as it can be prepared.

XI.—TORPEDO-BOAT DESTROYER FORCE.

110. I desire to relate the proceedings of some of the vessels of the 6th Destroyer Flotilla under the command of Captain Wilfred Tomkinson, and the Warwick flying my flag, which came under my own observation, or are of special interest or merit.

111. The Trident and Mansfield, after parting company from their submarines, covered the western flotilla of smoke-screening small craft. The Whirlwind, Myngs, Velox, Morris, Moorsom, and Melpomene covered the eastern smoke-flotilla. The Warwick, Phœbe, and North Star cruised off the Mole to protect the assaulting craft from torpedo attack. These duties took the destroyers close in shore, and they were frequently under a heavy fire from guns of all calibres at short range. When the assaulting craft were leaving the Mole the Warwick followed them for a few minutes, and then returned to assist the withdrawal of the small craft, picking up four motor launches, including No. 282, commanded by Lieutenant P. T. Dean, R.N.V.R. This launch had on board 101 people from Iphigenia and Intrepid, some of whom had been killed in the launch, and others who were wounded. As the motor launch was dangerously overloaded and full of wounded I ordered them to be transferred to the Warwick, which took more than half an hour to do. I was much struck with the gallant bearing of Lieutenant Dean and the survivors of his crew. They were all volunteers, and nearly all had been wounded and several killed.

112. While the Warwick was engaged as stated in the preceding paragraph, the North Star, having lost her bearings in the smoke, emerged from the smoke-screen to the south-eastward of the lighthouse. Seeing some vessels alongside the Mole,

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she fired all her torpedoes at them and withdrew; but coming under very heavy fire at point-blank range she was immediately disabled, and soon in a sinking condition. The Phœbe, commanded by Lieutenant-Commander Hubert E. Gore-Langton, was handled with conspicuous gallantry while under this heavy fire. She repeatedly circled round the North Star, making smoke screens and attempting under their cover to tow her out of action. She was twice successful in getting her in tow, the hawser being shot away once and parted once. Phœbe then went alongside North Star, and endeavoured to tow in that way. North Star, however, was in a sinking condition, and being continually hit. In these circumstances Mr. Gore-Langton ordered the abandonment of the North Star, standing by her, and taking off all of her company who were left alive.

113. I regret that the North Star was lost, but the conduct of Lieutenant-Commander Kenneth C. Helyar and his company was all that could be desired, the North Star not being abandoned until all possibility of salving her was gone. The Lieutenant-Commander of the Phœbe states that Mr. Helyar by his coolness and calm devotion to duty set a splendid example to all, though his ship was totally disabled and constantly being hit. He would not leave his bridge until ordered twice to abandon his ship when she was obviously sinking under him, and could not be saved. He also did his utmost to assist the Phœbe in every way to take him in tow.

114. Tempest and Tetrarch, of the Harwich Force, accompanied the Ostend blockships from the Goodwins until they reached the inshore smoke-screen off Ostend, after which they co-operated with the Dunkirk destroyers Faulknor, flying the broad pennant of Commodore Lynes, Lightfoot, Mastiff, Afridi, Swift, and Matchless in supporting the small craft inshore, within close range of the enemy's heavy batteries.

115. I wish to record my entire satisfaction with the good work done by the torpedo-boat destroyer force throughout the operations. The part taken by the Phœbe in protecting and endeavouring to tow out of action the North Star, and in the final rescue of her people, is a conspicuous example of the fine qualities of this branch of the service, and is highly creditable to Mr. Gore-Langton, his officers, and crew. I have already recommended that officer for promotion, as I consider that his personal and professional conduct on this occasion marks him as likely to be valuable in the higher ranks of His Majesty's service.

XII.—SMOKE SCREENS, MOTOR LAUNCHES, AND COASTAL MOTOR BOATS.

116. The orders for smoke-screening the approach and operations of the forces attacking Zeebrugge and Ostend, and the reports from the numerous motor launches and coastal motor boats employed on that duty, are necessarily too detailed to be recapitulated in a despatch of this general nature. Apart from the smoke apparatus supplied to the larger craft for self-protection, the duty of making smoke-screens and laying smoke floats was imposed on a large fleet of motor launches and coastal motor boats. Without the services of these little vessels for this duty, for rescue work and for inshore work generally, an attack of this nature could hardly have been considered.

117. *Smoke Screens.*—While the wind favoured the screens were efficacious. Captain Ralph Collins, who commanded the motor launches, reports that in some units in which the smoke-screens were maintained, and in which most of the boats were under fire, there were no boats hit; whereas, in one instance, which came under my own observation, the absence of a screen led to preventably heavy punishment. As to the smoke floats, the enemy sunk many of them directly they were laid, especially if, as happened in many cases, they emitted flame. Those which remained were effective.

118. *Motor Launches.*—These craft were under the command of Captain Ralph Collins at Zeebrugge, and Commander Hamilton Benn at Ostend. As to the handling of these craft, great credit is due to the leaders of sections for the way in which they led their boats up to their objectives. When the wind shifted, the commanding officers proceeded closer inshore to give as much protection to the attacking ships as possible. One unit, under Lieutenant Gordon S. Maxwell, R.N.V.R., went close inshore, and by dropping three floats without baffles succeeded in inducing the enemy to concentrate his fire on these floats. Lieutenant-Commander Dawbarn Young, R.N.V.R., was in command of M.L. 110. He had volunteered to precede the blockships and light the entrance of the harbour and canal with calcium buoys. Whilst approaching the entrance M.L. 110 was struck by three shells, which killed and wounded half the crew and wrecked the engines. Lieutenant-Commander Young, hit in three places, was mortally wounded, but stuck to his post and gave orders to abandon ship until he collapsed. This very

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gallant officer died before reaching Dover. Ever the first to volunteer for any dangerous work, the Dover Patrol has sustained a great loss by his death.

119. Of the meritorious work reported from the motor launches, I have already selected the instances of Lieutenant P. T. Dean, R.N.V.R., in No. 282, and Lieutenant H. A. Littleton, R.N.V.R., in No. 526, who brought off the crews of the sunken blocking ships. There is no doubt that these boats were handled in a magnificent manner, and that the highest praise is due to their officers and men. From Ostend reports of the motor launch flotilla are of the same high character. Commander Ion Hamilton Benn reports that M.L. 283 (Lieutenant Keith R. Hoare, R.N.V.R.) took on board the entire crew of Sirius and some of Brilliant's people, and was seriously overloaded, but was able to reach harbour safely. He cannot speak too highly of the conduct of Lieutenant Hoare and Lieutenant Rowland Bourke, R.N.V.R. (M.L. 276), who both showed remarkable coolness and good judgment throughout the operation. He also mentions Lieutenants, R.N.V.R., Sidney D. Gowing (M.L. 551), Rawsthorne Proctor (M.L. 556), and Malcolm S. Kirkwood (M.L. 11).

120. *Coastal Motor Boats.*—I have been greatly impressed with the administrative capacity of Lieutenant Arthur E. P. Welman, D.S.C., R.N., the young officer in charge of the coastal motor boats of the Dover Patrol. In the Zeebrugge operation he had seventeen of these vessels under his orders. Besides their screening duties, several of them undertook attacks on enemy vessels and against the Mole, the seaplane shed, etc., with success, Lieutenant Welman always being in the most exposed position. Sub-Lieutenant Cedric R. L. Outhwaite, R.N.V.R., in C.M.B. 5, reports that he attacked an enemy destroyer which was under way, and observed his torpedo hit below her forward searchlight, the light shortly afterwards going out, and her fire diminishing. Sub-Lieutenant L. R. Blake, R.N.R., in C.M.B. 7, reports hitting a destroyer alongside the Mole, with a torpedo, which struck below the fore bridge. No. 32A fired a torpedo at the steamship Brussels. An explosion followed, but the result was hidden by smoke.

Young officers in C.M.B.'s.

121. The zest of most of the young officers in the coastal motor boats, like that of those in the motor launches, compels one's admiration. I can select only one of many instances which show the eagerness of the officers to take part in a fight from which circumstances tried to exclude them. Lieutenant Edward E. Hill, in C.M.B. 35A, had the misfortune to foul his propellers on the evening of April 22nd, when already eighteen miles on his outward voyage. He got a tow from a drifter, and arrived at Dover at eight p.m. His boat was immediately hoisted and the propellers cleared, but as there was other damage he was not afloat again till 9.40 p.m. He then made his way to the Belgian coast, and was off Zeebrugge—about seventy miles—by 11.50 p.m., taking up his smoke-float patrol at once, and continuing it for an hour, in the course of which he came under rather heavy fire from a battery at Blankenberghe. The chapter of accidents amongst such small craft is naturally a long one, but the resource developed in overcoming them is more than compensation. The daring way in which the crews of these boats approach the shore, drawing the beams of the searchlights and the fire of the guns, then escaping in their own smoke, is splendid. Lieutenant Francis G. Harrison, who commanded the Ostend section of C.M.B.'s, mentions the names of Sub-Lieutenant Peter B. Clarke, R.N.R., Midshipman N. S. Herbert, R.N.R., and Chief Motor Mechanic G. H. Hebblethwaite (C.M.B. 10) for the dangerous work which that boat undertook in searching for the engineer of the Sirius, who was thought to be on board that ship after she had been sunk, in the course of which the boat came under very heavy fire; and Sub-Lieutenant A. W. Ramsay (C.M.B. 19) for his coolness and quickness in laying the inshore calcium buoys under heavy machine-gun fire. Lieutenant Welman also mentions the names of several officers and men in coastal motor boats; these will be forwarded for Admiralty consideration shortly.

XIII.—DOVER TRAWLER PATROL.

122. Captain William V. Howard, D.S.O., of the Trawler Patrol, accompanied the expedition in the paddle mine-sweeper Lingfield, and did valuable work in keeping touch with the force, giving assistance by towing, and otherwise helping small craft in trouble while on the passage to and from Zeebrugge, also in receiving the surplus crews from blockships, and escorting motor launches. This veteran officer has been on patrol work off the south-east coast of England during the whole of the war. His energy and example are great incentives to the officers and men of the Trawler Patrol which he commands.

XIV.—MEDICAL ARRANGEMENTS.

123. In conclusion, I desire to make a special reference to the praiseworthy manner in which the medical officers and their staff and volunteer helpers devoted their skill

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and sympathy to those who were wounded in these operations. Fighting at such close quarters. the casualties were bound to be numerous, and the wounds likely to be severe. Staff-Surgeon James McCutcheon, M.B., was the senior medical officer of the force. In an able report that officer outlines the work of his staff, and the circumstances in which it was done, and I trust that the Lords Commissioners will agree with me in thinking that no branch of the naval service surpassed in zeal and ability the efforts of the medical branch to prove itself worthy of its profession and of the occasion. I have selected with difficulty from a number of very deserving officers the names of three to be representative recipients of such promotion as their Lordships may be able to award for these operations to the medical branch of the Royal Navy.

I have the honour to be, Sir,
Your obedient Servant,
ROGER KEYES, *Vice-Admiral.*

ENCLOSURE.

PROCEEDINGS AT OSTEND. REPORT FROM COMMODORE, DUNKIRK.

Office of Commodore, Dunkirk, April 30, 1918.

SIR,—

I have the honour to forward the following report on Operation Z.-O., carried out on the night of April 22nd-23rd.

1. A brief preliminary report was 'phoned to Vice-Admiral, Dover Patrol, on April 23rd, since which photographs and air reconnaissances have established the facts (as reported) that—

(*a*) Sirius and Brilliant are not inside Ostend Harbour, but lie stranded about 2,400 yards to eastward of eastern pier.

(*b*) The Stroom Bank Buoy is not in its charted position, but is a little to eastward of the prolongation of eastern pier, approximately lat. 51 15 50 N., long. 2 53 20 E.

2. (*b*) accounts for (*a*); supposing, as is almost certain, that the buoy was in this position on the night of 22nd-23rd.

3. The location of *buoys* by aircraft is, of course, a very high art, and can only be done with any degree of accuracy with relation to closely surrounded land (or shoal) features.

Captain R. Graham, D.S.O., D.S.C., R.A.F., and Captain L. H. Slater, D.S.C., R.A.F., obtained the present position of Stroom Bank Buoy by coming down to 100 feet and fixing the buoy with reference, for direction, to the line of eastern pier.

4. The organisation detailed in my 0/53, of April 21st, was carried out for Ostend operation, which I conducted with the assistance of Commander J. L. C. Clark, D.S.O., R.N., from on board Faulknor, leader of the Off-shore Destroyer Force.

5. The operation was carried out according to programme. There were no hitches, the times were kept precisely, and I have complimented the senior officers of units, and all, on the care with which they both studied and carried out my necessarily rather voluminous orders.

6. (*a*) The wind, on starting out, was light north-westerly, and continued thus until about ten minutes before Sirius and Brilliant arrived at Stroom Bank Buoy, when it most unluckily shifted round to the south-westward, causing all the smoke to go wrong at the critical moment.

(*b*) The M.L.'s and C.M.B.'s strove with resolution and good judgment to compete with this reverse, but all their efforts were overpowered by the enemy's smoke screen blown to seaward, while they themselves became subjected to a heavy, but happily ill-directed, gunfire.

7. The blockships made the Stroom Bank Buoy (which was alight and marked the whole time, but after that the adverse smoke prevented them seeing anything by which they might have retrieved the error of the buoy's position.

8. (*a*) Since the Captains of the blockships, Commander A. E. Godsal, R.N., and Lieutenant Commander H. N. M. Hardy, D.S.O., R.N., will have made their full reports to you, I say little more, since, after what has been said, it is needless to remark that the failure to find the entrance was no fault of theirs; on the contrary, the newly discovered position of the buoy only too plainly shows that their course, after rounding the buoy, *ought* to have brought them right in.

(*c*) I may add that on my return to harbour about six hours later, the bitter disappointment of these two gallant officers showed itself chiefly in begging for another blockship apiece to have another try.

9. The low clouds and drizzle put all aircraft participation out of the question.

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10. The monitor and siege gun bombardments were undoubtedly useful as a blind, and to keep the fire of the shore batteries down.

The shore batteries commenced to return the monitors' fire about five minutes after the latter opened. A number of shell fragments were picked up on board the monitors but there were no hits. Photographs show a number of hits around the German batteries, but none on the guns.

11. (*a.*) This time the enemy took longer to be alarmed than on the night of the 11th-12th. He seemed to take but a desultory interest until the monitors opened fire, *i.e.*, about a quarter of an hour after the C.M.B.'s arrived at the Stroom Bank Buoy, and, as on the previous occasion, he cannot have had a single patrol out.

(*b.*) Very few shells fell near us in the off-shore destroyers. Enemy's fire was evidently either directed against the inshore boats, at the monitors, or barrage fire into the smoke areas.

(*c.*) His star shell, as before, averaged about 7,000 yards from the shore; when we closed to that range they dropped alongside of (one *on*) the division.

(*d.*) At intervals the enemy's star shell showed up to us the M.L.'s busily engaged with their smoke screens and at 11.50 also the blockships with their escort to the E.N.E. steering for the Stroom Bank Buoy. It was at this moment that we noticed the shift of wind to south-westward.

(*e.*) About ten minutes later the blockships disappeared abreast the buoy into the smoke, and we saw no more of them, but picked up Tempest and Tetrarch.

(*f.*) C.M.B.'s 12 and 19 report a "M.L. blew up" about 00·15. E.S.E., 2 miles from Stroom Bank buoy; this apparently refers to the blockships being hit by shell.

(*g.*) About 00·25 burst of firing became more frequent, and more searchlights switched on than before, evidently the result of the blockships' emergence from smoke and stranding.

(*h.*) After this there was little more than desultory firing, probably at monitors, with the exception of two 3-minute burst of barrage fire at 00·42-00·52.

The searchlights continued searching actively until about 01·30 when their numbers reduced to three or four.

(*i.*) At 01·00 the "retirement" red rocket signals and syren "K's" were made by destroyers; this produced a few big shrapnel in our neighbourhood.

(*j.*) A few C.M.B.'s and M.L.'s were seen coming away off and on up to 2 a.m., when we withdrew to fix position by R, R.M.C. Buoy, picking up No. 7 C.M.B., disabled, on the way. (Tetrach towed her home.)

(*k.*) Having fixed by Position R, we continued to cruise between R and Stroom Bank Buoy until daylight, and the shore became visible, when, nothing floating being in sight, all forces were withdrawn; B.C. Patrol being sent out later, and picking up the last straggler—viz., C.M.B. 17, who had run out of petrol near 3 B.C. Buoy.

(*l.*) At 03·20, when near Stroom Bank Buoy, we saw two searchlights, judged about 500 yards apart, concentrated on something burning in the water between them.

At 03·30 this fire culminated in an explosion, and darkness ensued, the two searchlights switched out a few minutes later.

(*m.*) No enemy craft were seen by anyone, except that C.M.B. 12 feels sure that she was chased by a destroyer with searchlights, but I cannot think a craft coming out of Ostend could have been seen by no one else or escaped us, for, apart from the star-shell illumination, the diffused moonlight gave quite one mile visibility.

12. On return to harbour about 07·30, I found that:—

(*a.*) All the crews of the blockships had been saved, the majority by M.L.'s 276, 283, and brought to Dunkirk; the few others who had evacuated in a pulling boat were picked up by the Gap Patrol.

(*b.*) This salvage work of M.L.'s 276 and 283 was carried out under heavy, but fortunately not accurate, fire with a courage and coolness that alone could have achieved its wonderful result, for not a man was wounded, and the heavily laden boats returned to harbour safely.

(*c.*) All the M.L.'s had returned intact with very slight casualties, and one damaged bow.

(*d.*) The C.M.B.'s, too, both for Zeebrugge and Ostend, had all returned safely, either to Dunkirk or Dover, with the exception of two or three which were retrieved later. Their *personnel* casualties were two dangerously wounded and four wounded considering the work done, a marvellous result, and one which reflects the greatest credit on the C.M.B. officers.

13. *Conclusions.*—(*a.*) The luck of the wind changing, combined with the shifting of the Stroom Bank Buoy, accounts for the failure to block Ostend Harbour. There is no discredit to anyone; indeed, none could have carried out their duties more admirably than did the Ostend forces on this occasion.

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(*b.*) I anticipate success in the new endeavour, the undertaking of which has only been waiting favourable weather conditions during the last few days.

(*c.*) The lion's share of the work was, of course, done by the C.M.B.'s, M.L.'s, and blockships.

I have, &c.,

HUBERT LYNES,
Commodore, Dunkirk.

Vice-Admiral Sir Roger Keyes, K.C.B., C.M.G., M.V.O., D.S.O., R.N., Dover.

THE SECOND ATTACK ON OSTEND.
MAY 10, 1918.

Fleet House, Dover,
June 15, 1918.

SIR,—Be pleased to lay before the Lords Commissioners of the Admiralty the following report on the renewed attempt made in the early morning of the 10th May, 1918, to block the entrance of the Ostend–Bruges Canal by sinking the Vindictive therein.

2. When I learnt on the 23rd April that the attempt to block Ostend had not succeeded, I represented to their Lordships the desirability of repeating the operation at once. The Vindictive, the only vessel available at the moment, being placed at my disposal, every effort was made to repair the damage she had suffered and fit her out before the expiration of the period in which the tide and darkness suited, *i.e.*, about four days. This was accomplished at Dover, thanks to the strenuous efforts of Rear-Admiral C. F. Dampier, the Superintendent of the Dockyard, and his small staff; the services of Engineer Commander Henry F. Bell, R.N., and Mr. A. J. Luke, being particularly valuable.

Two hundred tons of cement were put into the Vindictive's after magazines and upper bunkers on both sides, which was all her draught would permit her to carry, in view of the depth of water in the approaches to Ostend Harbour.

Major-General Sir William Hickey, K.C.B., Commanding Dover Garrison, most helpfully provided men for filling bags with cement and putting them on board.

3. As already reported in my last despatch, Commander Alfred E. Godsal, R.N., and Lieutenant-Commander Henry N. M. Hardy, D.S.O., R.N., of the Brilliant and Sirius respectively, had begged to be allowed to make another attempt, and had reported that all their officers and Petty-Officer Joseph J. Reed, of the Brilliant, had volunteered for this service. As Commander Godsal had led the previous attack, he was given command of the Vindictive, and Lieutenant Victor A. C. Crutchley, R.N., Sub-Lieutenant Angus H. Maclachlan, R.N., and Petty-Officer Joseph J. Reed, all of the Brilliant, accompanied him. Engineer Commander William A. Bury, R.N., however, claimed his right to remain in the Vindictive. This very gallant officer, who greatly distinguished himself on the 23rd April, represented that his knowledge of the engines and boilers of his ship should be utilized. He further begged that Engine Room Artificers Hubert Cavanagh, Norman Carroll, Alan Thomas, and Herbert Alfred Harris, who also volunteered, might be allowed to remain with him. I acceded to his request.

Lieutenant Sir John Alleyne, D.S.C., R.N., of H.M.S. Lord Clive, who had been most useful in fitting up the navigational arrangements which were destroyed on the 23rd April, asked to be allowed to navigate the vessel during the operation. I approved of this request, feeling that this officer's experience and intimate knowledge of the shoals and currents on the Belgian coast would be of great value to the Commander of the Vindictive.

The crew were selected from a very large number of volunteers from vessels of the Dover Patrol.

4. The Vindictive was in all respects ready by the desired date, but the weather was unfavourable, and the operation had to be postponed until the necessary condition of tide and darkness recurred. This delay made it possible to prepare a second ship, the old cruiser Sappho, which was taken from Southampton to Chatham and fitted out by Chatham Dockyard with the greatest celerity and thoroughness.

5. Lieutenant-Commander Hardy took command of her, and he was accompanied by all the officers of the Sirius, Lieutenant Edward L. Berthon, D.S.C., R.N., Sub-Lieutenant Alfred V. Knight, R.N.R., and Engineer-Lieutenant William R. McLaren, R.N. Her crew were selected from a very large number of volunteers in the Royal Naval Barracks at Chatham.

6. Aerial observation on the 9th May showed that many torpedo and submarine craft were still shut up in Bruges, and proved that the effectiveness of the blocking of the Zeebrugge branch of the canal was maintained up to that date. Although the

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craft so shut up in Bruges have been unable to use the small waterways to Ostend, the latter port was still being used by enemy torpedo craft and submarines.

7. Other information, confirmed by aerial observation, also disclosed the fact that to counterbalance the forced inactivity of the craft in Bruges, and probably to resist any repetition of the April attack, a considerable number of German destroyers had joined those units of the Flanders force which were outside the canal on the night of the 22nd-23rd of that month.

Commodore Lynes's command.

8. Commodore Hubert Lynes, C.M.G., at Dunkirk, having so ably carried out the direction of the former attempt as part of the Zeebrugge and Ostend scheme, I entrusted the conduct of the operations on this occasion to him, placing under his orders all the monitors, destroyers, motor launches, and coastal motor boats required, in addition to the blocking ships Vindictive and Sappho. On the evening of the 9th May, the weather conditions being most promising, the Vindictive and Sappho sailed in company to join Commodore Lynes at Dunkirk.

His report, which is attached, furnishes the details of the operations.

9. In order to prevent interference from Zeebrugge by the newly-arrived enemy destroyer force mentioned in paragraph 7, H.M.S. Warwick, flying my flag, and a division of destroyers consisting of H.M. Ships Whirlwind, Velox and Trident, under Captain Wilfred Tomkinson, R.N., cruised midway between Ostend and Zeebrugge.

10. Meanwhile the operation proceeded in accordance with the plan, except for the unfortunate breaking of the Sappho, due to a boiler accident, which reduced her speed to such an extent that she was unable to reach her destination in time to take part. This halved the chances of success, and was a great misfortune.

Vindictive.

With regard to the proceedings of Vindictive, I cannot do better than quote from the report of Lieutenant Victor Crutchley, on whom the command devolved when Commander Godsal was killed and Lieutenant Sir John Alleyne seriously wounded:—

"On arrival at Position P, course was altered for the Stroom Bank Buoy. The boat marking the buoy was seen and left close on the port hand; the buoy was not seen. Speed was reduced to 12 knots on passing the buoy.

"At this time the smoke screen was excellent. There was a lane between the eastern and western sections, and the only fire experienced was shrapnel, which I considered was fired at a venture, and did no harm. We ran on for thirteen minutes from the Stroom Bank buoy, and then, as the entrance was not sighted, altered course to the westward parallel to the shore, and reduced to 60 revolutions (9 knots). As we still failed to see the entrance we altered course 16 points to starboard, and returned along the shore to the eastward. We again failed to find the entrance, and so altered course 16 points to starboard. All this time, owing to fog and smoke, the visibility was not more than 1½ cables. This time the entrance was sighted about one cable on the port beam, and at the same time the ship came under a very heavy fire from shore batteries of all descriptions.

"On sighting the entrance, in accordance with previous orders, I passed the order 'preparatory abandon ship' to the engine-room. As soon as the entrance was sighted the ship was handled from the conning tower. Commander Godsal immediately turned up for the entrance and ordered smoke to be lighted. At about this time communication with the after control failed. Just after the entrance was passed Commander Godsal went outside the conning tower and gave the order hard-a-starboard from outside.

"Immediately after this a heavy shell burst either on the conning tower or very close to it; Lieutenant Alleyne was knocked out, and Commander Godsal was not seen again, and all the occupants of the conning tower were badly shaken. I then ordered the port telegraph to full speed astern, to try to swing the ship across the channel. She grounded forward on the eastern pier when at an angle of about three points to the pier. As the ship stopped swinging, and at the time I considered that no more could be done, I ordered the ship to be abandoned.

"When the engine-room had been abandoned, Engineer Lieutenant-Commander Bury blew the ship up by firing the main charges and after auxiliary charges, and I endeavoured to fire the forward auxiliary charges. There was a considerable shock when the first set of charges were fired. I am not positive that the forward auxiliary charges fired, as I could not distinguish the shock from other disturbances.

"When I got on board M.L. 254 I found that the First Lieutenant had been killed by a shell bursting, also one deckhand. The captain, Lieutenant Geoffrey H. Drummond, R.N.V.R., and the coxswain had been wounded. We went out of the harbour stern first, followed the whole way by machine-gun fire. On finally going ahead the forecastle flooded, and the boat was very much down by the bows. The pump and buckets were got under way, and all spare hands placed right aft. However, the water was gaining, and S.O.S. was made by

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flashing lamp continually to seaward. The courses steered from Ostend were north for 15 minutes, and then west by north until picked up by Warwick.

"I cannot speak too highly of the bravery of the M.L.'s coming alongside inside Ostend; they were under a continuous and heavy fire. M.L. 254 rescued two officers and 37 men.

"The question of recommendation is a very difficult one. Every man, without exception, behaved splendidly."

11. It had been Commander Godsal's intention to ram the western pier with the object of swinging the ship across the channel under port helm, a manœuvre that would have been greatly assisted by the tide, which was setting strongly through the piers to the eastward. It would appear that when the Vindictive eventually found the entrance she was too close to the eastern pier to use port helm without risk of grounding broadside on. This would account for Commander Godsal's order "hard a starboard" a few seconds before he was killed. The Vindictive was thus committed to starboard helm when the command devolved on Lieutenant Crutchley, who very promptly put the port telegraph to full speed astern. Unfortunately the port propeller, which was very severely damaged against Zebrugge Mole, was of little value. Due to this, and also to the fact that the tide was setting strongly against her starboard side, the ship's stern did not swing across the channel as desired, with the result that she grounded at an angle of 25 degrees to the eastern pier, leaving a considerable channel between her stern and the western pier.

12. At 2.45 a.m., fifteen minutes after the programme time for the withdrawal of the motor craft, the Warwick and her consorts proceeded slowly to the westward parallel to the coast.

13. At 3.15 a.m. a signal of distress was observed from the direction of Ostend. I directed the division to close, and found M.L. 254 (Lieutenant Geoffrey H. Drummond, R.N.V.R.) badly damaged and in a sinking condition, with two officers and thirty-seven men of the Vindictive's crew on board. Lieutenant Drummond was very severely wounded, his second in command, Lieutenant Gordon F. Ross, R.N.V.R., and other men killed, and most of her small crew and many of the Vindictive's, including her gallant Engineer Commander, were wounded. They were transferred to the Warwick, and this took half an hour to do, on account of the serious condition of some of the wounded.

14. Dawn was now breaking, and H.M.S. Warwick and her consorts were within close range of the enemy's batteries. M.L. 254 was too badly damaged forward to allow of her being towed, and was rapidly settling down. I ordered her to be destroyed, and, as soon as this had been carried out, withdrew the division at 25 knots.

15. By this time the tide had fallen so low that it was inexpedient to return by the route inside of the shoals by which the approach had been made, and a course was steered for a gap in the net defence by the deep-draught route from Ostend to seaward.

It would seem that the enemy had mined this route in anticipation of an attack. At 4.0 a.m. H.M.S. Warwick struck a mine, which broke her back just before the superstructure of the after superimposed 4-inch gun, and destroyed the after part of the ship. She took a heavy list and appeared to be settling by the stern. H.M.S. Velox was ordered alongside H.M.S. Warwick, and the wounded, of whom there were a large number on board, were transferred to the former. H.M.S. Whirlwind then took H.M.S. Warwick in tow, and the latter being unable to steer, H.M.S. Velox was kept alongside while navigating the channels through the shoals to the open sea.

I arrived at Dover in H.M.S. Warwick at 4.30 p.m.

16. I have again to refer to the fine work done by the motor launches and coastal motor boats, as reported in paragraph 29 of the Commodore's letter. Their conduct in the late operation confirms the opinion I expressed of them in my despatch on the previous operations.

17. The co-operation of the Air Force, under Brigadier-General Charles L. Lambe, C.M.G., D.S.O., R.A.F., was of great value during the operation. In spite of the fog the 214th Squadron (Squadron-Commander Herbert G. Brackley, D.S.O., D.S.C.) continued to attack in accordance with the programme until after the completion of the operation.

18. I greatly regret the loss of so fine an officer as Commander Godsal. His zeal to retrieve the failure of the Brilliant on the 23rd April impelled him to disregard all protection in order to secure success on this occasion.

19. As on April 22-23, I am much indebted to Vice-Admiral Pierre Alexis M. A. Ronarc'h, Commandant Supérieur de la Marine dans la zône des Armées du Nord, Dunkerque, who placed at my disposal all the available vessels under his command, and assisted me in every possible way. The French torpedo craft and M.L.'s performed valuable service in connexion with the monitor bombardment.

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20. I commend Commodore Hubert Lynes to their Lordships' favourable consideration.

The officers and men mentioned by him are being included in my list of recommendations, which will be forwarded as soon as possible.

I have, &c.,
ROGER KEYES,
Vice-Admiral, Dover Patrol.

ENCLOSURE.

Office of Commodore, Dunkirk.
May 15, 1918.

Blocking operations at Ostend.

SIR,—I have the honour to forward the following report on the operations for blocking Ostend Harbour, carried out on the night of May 9-10, 1918.

2. It will be remembered that on the night of April 22-23, when the forces under your command so successfully achieved the blocking of the Zeebrugge-Bruges Canal, the Western Squadron, under my Command, was unsuccessful in its attack; simultaneously delivered, and with the same object on Ostend.

3. The failure on that occasion was due, firstly, to the adverse shift of wind that blew all our smoke screens across the harbour entrance at the critical moment, and secondly, to the displacement—whether by design or chance on the enemy's part—of the Ostend Buoy, whose normal position had formed a convenient departure point for the blockships.

4. Our lack of success was the fortune of war, not the fault of any one concerned; indeed, no one could have carried out their duties more admirably than did the Ostend forces that night, and I am deeply grateful that, in recognition of this fact, you were so considerate as to place the organization and leadership of another attack in my hands.

5. In the first operation the blockships had advanced under cover of a smoke screen, guided by the lights and signals made by the small craft (C.M.B.'s and M.L.'s) working close inshore. I decided to adopt in general a similar plan for the new attack, but previous experience, and the necessity for assuming that the enemy would make counter preparations against an exactly similar attack, called for modification in detail.

6. In preparing for the new attack, particular attention was paid to perfecting the navigational arrangements; numerous small, but important, improvements were introduced into the smoke gear, and the alternatives for guiding the blockships into the entrance were made so numerous as to reduce chance of failure, in that respect, to the smallest possible dimensions.

7. The quicker the delivery of the new attack the greater the element of surprise, and consequently of success. Realising this, special efforts were made both at Dover and Dunkirk, so that within a few days of the first attack, Vindictive had been prepared for her new *rôle* of blockship, all the small craft had been completed with their smoke lights and other fittings, and reorganised according to the new plan of attack, which had been promulgated to all concerned.

The alternative plans of attack, "V.O." and "V.S.," were submitted to you in my operation orders 0/54 and 0/58 respectively.

8. For this rapid and satisfactory work of preparation at Dover, I beg particularly to offer my grateful thanks to Commodore the Hon. A. D. E. H. Boyle, C.B., M.V.O., Chief of the Staff, who left no stone unturned to have all my numerous requests carried out; for that at Dunkirk, I am chiefly indebted to the energy of Commander J. L. C. Clarke, D.S.O., R.N., my Second-in-Command; to Lieutenant-Commander F. H. Sandford, D.S.O., R.N., the staff officer you were good enough to lend me, who was mainly responsible for the smoke screen organisation; and to Lieutenant H. F. Witherby, R.N.V.R., my staff intelligence officer, whose knowledge of the enemy's coast and close association with air reconnaissance work of the 61st (Naval) Wing were invaluable.

9. The elements were, however, against us—for despite all these preparations, strong northerly winds, with rough seas, precluded all possibility of the enterprise up to a period when the conjunction of darkness and tide, in its turn, demanded postponement until the second week of the present month.

10. This enforced period of inaction was occupied in perfecting and testing the arrangements, and, above all, in the preparation of a second blockship, which, on your representation, was ordered to be prepared and fitted out by His Majesty's Dockyard, Chatham.

11. The conjunction of darkness and tide made the night of May 9th-10th the first favourable night of the new period. By good fortune the weather conditions on the 9th gave every indication of promise, and accordingly on the afternoon of the 9th the operations were put in progress, firstly by the passage of Sappho to Dover,

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and later by the passage of both blockships, with their supporting and escorting forces, from Dover to Dunkirk. It was at first doubtful whether Sappho could be completed in time, but Chatham Dockyard made great efforts, and Sappho arrived at Dover with several hours in hand.

12. For days preceding the operation, rain, cloud, and mist had prevented more than the scantiest air reconnaissances, but towards sunset on the 9th, *i.e.*, when the blockships were already steaming eastwards, an air reconnaissance announced that all the buoys off Ostend had apparently been removed. At considerable risk of having to land after dark, Squadron-Commander Ronald Graham, D.S.O., D.S.C., himself at once went out, returned safely, and confirmed the report.

This new move on the enemy's part had to be countered; we accordingly arranged to lay a special (calcic-phosphide) light buoy of our own, which subsequently made a satisfactory departure point for the blockship and smoke screens.

13. The weather conditions as night advanced continued excellent, wind N. by W., sky clear, atmosphere good, both for air work and navigation, sea smooth enough for the small craft to operate, barometer steady, and conditions likely to remain stable.

14. Vindictive and Sappho arrived in Dunkirk Roads in good time, disembarked their surplus crews, and then proceeded with their escorts at the appointed time in the programme. Sappho, however, had scarcely left the anchorage than a man-hole joint in the side of her boiler blew out, reducing her speed to about six knots, and therefore putting her participation that night out of the question.

15. This very serious reduction of blocking material required consideration whether or no it was advisable to proceed with the operation.

I decided to continue with Vindictive, and signalled to Commander Godsal that I have every confidence he would do his best without Sappho. I also informed you by W/T of my decision.

16. This done, I proceeded on board Faulknor (Commander Henry G. L. Oliphant, M.V.O., D.S.O.), leader of the off-shore supports, to overtake the other forces, who, in accordance with orders, were already well on their way to their various stations. Commander Clarke and Lieutenant-Commander Sandford accompanied me in Faulknor to carry out staff work, and were of great assistance to me in conducting the operations.

17. After the sudden removal of the buoys, and in the knowledge that nine enemy destroyers had been seen in the offing late that evening, I had fully expected enemy interference with our plan before reaching the place off Ostend where we should lay our buoy and spread the small craft. But no, nothing occurred. The enemy star shells and "flaming onions" fired intermittently from the coast during the approach were evidently only part of his new searching routine. Once again his preparations against surprise included no patrol craft in the offing.

By 1.30 a.m. all preliminary dispositions had been completed, and the (advanced) inshore forces, *i.e.*, the C.M.B. and M.L. divisions, sent in to carry out their various duties.

18. One new feature of the present plan was that there should be no *preliminary* bombardments or air raid; we were to make no attacks until our sea force were discovered by the enemy.

19. At 1.35 a.m. there was still no firing from the shore, but a searchlight lit up and commenced to search. The C.M.B.'s had arrived, and were running their smoke screens. The noise of their engines, and those of the M.L.'s approaching on their heels, was, of course, carried ashore by the breeze.

At 1.43 a.m. I gave the pre-arranged signal to "open fire," which was immediately responded to by the monitors, siege guns, and the air squadrons. Bombs and shells, whose bursts could be seen over the top of our smoke screen, were undoubtedly giving the enemy a warm time, and constituting a protection to the small craft inshore.

20. Shortly before this, I had noticed with some anxiety the gathering of light-drifting "clouds"—but good-sized gaps, through which stars shone, could be seen at 1.45 a.m., when the sky became completely overcast, and five minutes later we were enveloped in a thick sea fog which, for the next all-important hour, reduced our means of keeping in touch with events to sound alone.

21. I felt that we could hope for no more air or monitor bombardments, and that thus deprived of their valuable support, the small craft inshore would suffer in proportion, but fortunately this was not the case. The fog proves to have been merely a local patch, not extending to the monitors to the westward, and was also sufficiently low-lying to enable the airmen to continue their attacks between it and the true cloud system at some 10,000 feet altitude.

To realise these conditions, and the darkness due to the absence of moon, and to know that the Royal Air Force carried out its whole programme is, in itself, a very high tribute to the efficiency of the air squadrons, who, under the orders of Brigadier-

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General Charles L. Lambe, C.M.G., D.S.O., took part in the operations. All our aeroplanes eventually returned to their aerodromes; some landed well to the westward, naturally under difficulties, one crashed so badly that the pilots were both severely injured.

The monitors, too, did good and useful work—particularly Prince Eugene. Captain Ernest Wigram, D.S.O., led his division well inside range limits, in order that guns of the secondary armament might play a part as well as the big guns. This they did with good effect, and it is really rather wonderful that his division escaped without injury, for his front rank position put him inside the enemy's long-ranged star shells, and brought his division under a heavy fire from the shore batteries.

The R.M.A. siege guns, under Colonel Pryce Peacock, also maintained a valuable fire on the enemy's heavy coast batteries throughout the operation.

22. To return to Ostend. 2 a.m., *i.e.*, Vindictive's programme time to arrive at the piers, was signalled by a heavy cannonade of quick-firers and machine-gun fire near the entrance. The enemy had now almost certainly realised the nature of the attack, and since the smoke screens and the fog prevented him aiming at definite objectives, except when the small craft ran close alongside to fire torpedoes at, or engage the pier-heads with their machine guns, he concentrated his effort in a continuous barrage fire across the entrance from the whole of the exceedingly formidable array of batteries in the neighbourhood of Ostend.

23. For the next twenty minutes, the critical period during which Vindictive must succeed or fail, the offshore destroyer forces were ordered to fire star shell over the entrance, and shell at the enemy's batteries—the former to light up the pierheads for Vindictive, and the latter to divert the enemy's attention further seaward. This firing was useful; the inshore forces were encouraged by having audible proof of our support close behind them, and the enemy diverted a small proportion of his fire. Very few shells came near us, however, either at this time or later; there were no casualties either to material or *personnel* among the off-shore forces. I attribute this mainly to the fog and smoke screens.

24. Meanwhile, Vindictive, after passing our calcic-phosphide buoy, had arrived "on time" at where she expected to find the entrance. The fog, and apparently also some of the smoke borne on an easterly draught of air (the result of wind impinging on the tall houses on the sea front), had reduced the seashore visibility to 200 or 300 yards at the most, and nothing could be seen.

Vindictive accordingly reduced speed, turned about, and searched to the westward. Still finding nothing, she again turned about, steering slowly eastward, and gave the "last resort" signal to her C.M.B. escort. This signal was obeyed by lighting a million candle-power flare close inshore to the westward of the entrance. In most circumstances, the illumination of the whole sea front by this intensely brilliant flare would probably have brought very heavy casualties to the inshore craft and Vindictive herself, through placing them under accurate gunfire, but on this occasion the fog, hitherto our enemy, now proved our friend, for while the flare showed Vindictive the piers, the small craft still remained ill-defined or invisible, except at closest range.

25. Vindictive now became clearly visible to the enemy's batteries, who concentrated all efforts on her, but she had only 200 yards to go, and Commander Godsal immediately turned up for the entrance.

Communication between the conning tower and the after control soon failed, and, the entrance being passed, Commander Godsal went outside the conning tower and gave the necessary orders for placing the ship in her blocking position.

At this moment a very heavy shell burst, either on the conning tower or close to it. This must have killed Commander Godsal, for he was seen no more; and later, after the ship had been sunk in the channel, careful search failed to reveal his body.

This very gallant officer must have known before being killed that his efforts were crowned with success. Lieutenant Sir John Alleyne was knocked out, severely wounded in the stomach, and all the occupants of the conning tower were badly shaken by this shell. Lieutenant Victor Crutchley then took command, and endeavoured to place the ship across the channel. The sinking charges were fired by Engineer Lieutenant-Commander William A. Bury, and preparations made to abandon ship.

26. All this time Vindictive was continuously fired at, both by heavy and machine-guns, and repeatedly hit; the after control had been completely demolished, killing Sub-Lieutenant Angus Maclachlan and all with him, and the whole upper deck was a mass of *débris*.

Notwithstanding this, perfect order was maintained, and a careful search for wounded was made before embarking in the two M.L.'s (Nos. 254 and 276), who had run in through the fire zone to effect the rescue.

27. Motor Launch 254 (Lieutenant Geoffrey H. Drummond, R.N.V.R.), coming

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alongside Vindictive's inshore side, embarked Lieutenant Crutchley, Engineer Lieutenant-Commander Bury, and thirty-seven men. With his First Lieutenant (Lieutenant Gordon Ross, R.N.V.R.) and Deckhand J. Thomas killed, his coxswain wounded, and himself wounded in three places, Lieutenant Drummond backed his now heavily laden motor launch out of the harbour, still under a tremendous fire, cleared the entrance, and made straight to seaward.

Arriving outside the fire zone, Lieutenant Drummond found his launch gradually filling forward from her injuries. Standing on at slow speed through the fog, and contriving somehow or other to pass close to the offshore destroyers without either getting in touch, M.L. 254 was most fortunately picked up in a sinking condition about forty minutes after leaving Ostend by your flagship Warwick. Rescuers and rescued were quickly taken on board, and M.L. 254 then sank.

28. M.L. 276 (Lieutenant Rowland Bourke, R.N.V.R.), having followed Vindictive into Ostend (engaging both piers with his machine-guns *en route*), went alongside Vindictive after M.L. 254, with her first-rescued party, had shoved off.

After much search and shouting, and still under a very heavy fire, Lieutenant Bourke and Sub-Lieutenant Petrie managed to find and embark the last three of Vindictive's survivors (Lieutenant Alleyne and two ratings), all badly wounded, in the water clinging to a capsized skiff.

This fine rescue effected, M.L. 276, hit in fifty-five places and with three of her crew killed or wounded, cleared the harbour, and was able to continue steering to the westward until picked up and taken in tow by Prince Eugene.

29. The small inshore craft—C.M.B.'s, under Lieutenant Arthur E. P. Welman, D.S.C., R.N., and Lieutenant Francis C. Harrison, D.S.O., R.N., and the M.L.'s under Commander Ion Hamilton Benn, D.S.O., R.N.V.R., as before, carried out all their duties splendidly; to them must be given the chief honours for having guided Vindictive in.

Daring exploits of these small craft, all contributory to the general success, are numerous; they are recounted by the senior officers of divisions in their detailed reports, but I would specially mention the following:—

C.M.B. No. 25 (Lieutenant Russell H. McBean, R.N.) escorted Vindictive with smoke screen close up to the entrance, where she assisted her with guiding lights, then torpedoed the piers, and finally engaged the machine-guns there with his own machine-guns with apparently good effect, during which Lieutenant McBean was wounded and Acting Chief Motor Mechanic G. E. Keel killed. Having seen Vindictive inside the piers, and her work being completed, Sub-Lieutenant George R. Shaw, R.N.R. (second-in-command), brought her safely back to harbour, Motor Mechanic A. J. Davies filling Chief Motor Mechanic Keel's place, and keeping the engines running most efficiently.

C.M.B. No. 24 (Lieutenant Archibald Dayrell-Reed, D.S.O., R.N.R.) and C.M.B. No. 30 (Lieutenant Albert L. Poland, R.N.), both carried out successful torpedo attacks on the pier ends, afterwards laying and maintaining good smoke screens close inshore throughout the remainder of the operation.

C.M.B. No 26 (Lieutenant Cuthbert F. B. Bowlby, R.N.) escorted Vindictive close up to the entrance, then ran ahead, and, finding one of the piers, fired his torpedo at it. The water being shallow, and range short, the explosion shook the boat so severely as to damage her engines and open her seams. She commenced to sink, but by his presence of mind, and the cool perseverance of Chief Motor Mechanic G. W. McCracken, Lieutenant Bowlby got the leak stopped, engines going again, and brought his boat out of the fire zone, where Commander Bertram H. Ramsay, leader of one of the offshore divisions, took her in tow.

C.M.B. No. 22 (Lieutenant William H. Bremner, R.N., with Lieutenant Arthur E. P. Welman, D.S.C., Senior Officer of C.M.B.'s abroad), when carrying out her smoke-screening of the shore batteries, encountered close inshore an enemy torpedo boat, who switched on her searchlight and opened fire. C.M.B. No. 22 had no better weapon than her Lewis guns, but with these she attacked and peppered the torpedo boat to such good effect as to drive her away from the harbour entrance, and prevent her interfering with the blocking operation.

C.M.B. No. 23 (Lieut. the Hon. Cecil E. R. Spencer) escorted Vindictive close inshore, and kept touch with her until Vindictive gave the "last resort" signal, on which C.M.B. No. 23 laid, and lit, the million candle-power flare, by whose light Vindictive eventually found her way in.

30. To recount the foregoing exploits of the small craft is in no way to detract from the praise due to all, particularly to the senior officers of units, for the care and precision with which they carried out my necessarily rather elaborate orders.

31. The general retirement was well executed, and without further casualties or incident, the supporting forces remaining out until daylight to pick up any disabled small craft who might still be out. There were none, however; those who were unable to return by their own power had already been towed home.

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32. No interference by enemy craft was experienced throughout the operation, but from subsequent reports of some of the inshore craft it appears that several German torpedo boats were lying close under the shore batteries the whole time, and made no move to come out.

33. Our casualties were remarkably light—two officers and six men killed, five officers and twenty-five men wounded, two officers and nine men missing, believed killed. Our only loss in material is M.L. 254. A number of the small craft were considerably damaged by gunfire, but all these are, or will be shortly, ready for action again. The light casualty list must be attributed to the efficient smoke screens, and probably also to the fog.

34. Of the Sappho, I can but record the bitter disappointment of all aboard her at the accident that prevented her following Vindictive. One and all, they begged to be given another chance, and when the day comes for their request to be granted, I am sure they will not be found wanting.

I have, etc.,

HUBERT LYNES, *Commodore.*

To Vice-Admiral Sir Roger Keyes, K.C.B., C.V.O., D.S.O.

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THE GRAND FLEET.

On April 7th the Grand Fleet ceased to exist as such, and Admiral of the Fleet Sir David Beatty hauled down his flag in the Queen Elizabeth. On the next day the Home and Atlantic Fleets were organised, and other formations announced.

The following was Sir David Beatty's farewell to the officers and men of the Queen Elizabeth, embodying his general order to the Grand Fleet :—

I am taking this opportunity of saying good-bye to my shipmates, and in doing so I will read to you the last general order which I shall issue to the Grand Fleet :—

"In bidding good-bye to the Grand Fleet, I desire to express to officers and men the deep regret which I feel at leaving those who have shared so loyally and devotedly the stress of the past years of war. In success, in disappointment, and in monotony the spirit of the Fleet has been beyond praise, and the highest traditions of our great Service have been upheld. I leave in full confidence that the spirit of the Grand Fleet will remain, that the lessons learnt in the war will be laid to heart, and that the mutual respect and understanding which exist between officers and men will be maintained and fostered for the safety and honour of King and Empire."

Tribute to the Queen Elizabeth.

I need hardly say that my wishes as regards the Queen Elizabeth will be fulfilled. For over two years she has carried my flag under conditions unprecedented, and during that time the Queen Elizabeth has made a name for herself worthy of her position as the Fleet flagship. In efficiency, in smartness, in cleanliness, and in good spirit the Queen Elizabeth has shown an example to the rest of the Fleet which a Fleet flagship ought to do. When my flag comes down you will carry the flag of my second-in-command, and under him I am quite sure the reputation which the Queen Elizabeth has established will be maintained. You have to remember that the period in front of us is going to be different. Reaction sets in, new features appear, and new difficulties arise, all of which have got to be overcome. But I am confident that in the future, as in the past, the Queen Elizabeth will live up to the reputation which she has made. It is a great one, and it will be difficult; but those who are left on board can do it. The spirit of the Queen Elizabeth and the spirit of the Grand Fleet will remain.

I thank you, Captain Chatfield, officers, chief petty officers, petty officers, non-commissioned officers, and men for your loyal and whole-hearted support during the two years past. Without that support my task would have been much more difficult. Recently, at Liverpool, you were able to realise something of the feeling in the country with which the Navy is considered. You were fortunate in being there, and I hope you will all pass on to your friends in other ships the knowledge that you have gained that the people of this country are fully aware of what they owe to the Navy, and are full of gratitude to the Navy for the part that they have played.

I was proud to have representatives of my flagship to support me on that occasion. I received the freedom, not as David Beatty, but as the representative of the Grand Fleet. The honour is to you as much as it is to me, and in all subsequent functions of that sort, the honour that is being done to me embraces every man in the Fleet. I am the figurehead. I have to make the speeches, but you are really the recipients of the honours just as much as I am, and I think that at Liverpool they made that quite plain.

Obligations of the Navy.

It is good for you to know that the feeling in the country is what it is. Sometimes in the Navy we have a sort of feeling in our minds that because we are out of sight we are out of mind. That is not so. Therefore, I would remind you that that feeling entails certain obligations upon us, that we have to continue to hold ourselves worthy of the trust, that unfailing trust, which England has in the great Service to which we all have the honour to belong.

I now say good-bye to you. This is to me a sad day because it brings to an end my service in the Fleet, and I may say my service afloat. I am still a servant of the State, and so long as I may be employed, or am employed, in the service of the State or in the service of that great Service to which you all know I belong body and soul, you may depend upon my sympathising with you and assisting every man and officer in the Fleet in his just aspirations. What the future holds for us I cannot say: I will not prophesy. I thank you, and, remember, that although I have gone I still remain a comrade and friend. Good-bye.

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NAVAL LOSSES IN THE WAR.

PERSONNEL.

The Secretary of the Admiralty issued the following statement of the total number of casualties, from the outbreak of the war to November 11, 1918, the date of the signature of the armistice, to officers and men of the Royal Navy (including the Royal Naval Air Service to March 31, 1918), and Royal Marines, but excluding the Royal Naval Division, already included in the figures published by the War Office :—

—	Dead (including died from wounds and from other causes).	Wounded.	Missing.	Interned and Prisoners of War.	Total.
Officers. . .	2,466	805	15	222	3,508
Men . . .	30,895	4,378	32	953	36,258
Total . .	33,361	5,183	47	1,175	39,766

The above figures included a number of officers and men of British merchant ships and fishing vessels serving on board his Majesty's ships and auxiliaries and other commissioned vessels.

In addition, whilst pursuing their ordinary vocations, 14,661 officers and men of the merchant and fishing services had lost their lives through enemy action, and 3295 had been captured and detained in enemy countries as prisoners of war.

SHIPS AND VESSELS.

(Showing those destroyed by mine, submarine, collision and marine casuality. Armed auxiliaries are not included, except in a few cases.)

GREAT BRITAIN.

Battleships.

Audacious .	By mine, North Coast of Ireland, Oct. 27, 1914.
Britannia .	By submarine off Cape Trafalgar, Nov. 9, 1918.
Bulwark .	Blown up off Sheerness, Nov. 26, 1914.
Cornwallis .	By submarine off Malta, Jan. 11, 1917.
Formidable .	By submarine in Channel, Jan. 1, 1915.
Goliath . .	By T.B. off Dardanelles, May 13, 1915.
Irresistible .	Sunk off Dardanelles, Mar. 18, 1915.
King Edward VII.	By mine, Jan. 6, 1916.
Majestic . .	By submarine off Dardanelles, May 27, 1915.
Ocean . .	Sunk off Dardanelles, Mar. 18, 1915.
Russell . .	By mine, Mediterranean, Apr. 27, 1916.
Triumph .	By submarine off Dardanelles, May 25, 1915.
Vanguard .	Destroyed by internal explosion, July 9, 1917.

Battle-Cruisers.

Indefatigable, Invincible, Queen Mary	Sunk in Jutland Battle, May 31, 1916.

Cruisers.

Aboukir . .	By submarine, North Sea, Sept. 22, 1914.
Argyll . .	Wrecked, E. coast of Scotland, Oct. 28, 1915.
Black Prince	Sunk in Jutland Battle, May 31, 1916.
Cochrane .	Wrecked, Liverpool, Nov. 14, 1918.
Cressy . .	By submarine, North Sea, Sept. 22, 1914.
Defence . .	Sunk in Jutland Battle, May 31, 1916.
Drake . .	By submarine, North Channel, Oct. 2, 1917.
Good Hope .	Sunk by Scharnhorst and Gneisenau off Valparaiso, Nov. 1, 1914.
Hampshire .	By mine, off Orkneys, June 5, 1916.
Hawke . .	By submarine, North Sea, Oct. 16, 1914.
Hogue . .	By submarine, North Sea, Sept. 22, 1911.
Monmouth .	Sunk by Scharnhorst and Gneisenau off Valparaiso, Nov. 1, 1914.
Natal . .	Blown up, Dec. 31, 1915.
Warrior . .	Sunk in Jutland Battle, May 31, 1916.

Light Cruisers.

Amphion .	By mine, North Sea, Aug. 6, 1914.

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GREAT BRITAIN—*continued.*

Light Cruises—continued.

Arethusa	By mine, North Sea, Feb. 11, 1916.
Brilliant	Sunk as blockship, Ostend, Apr. 23, 1918.
Cassandra	By mine, Baltic, Dec. 5, 1918.
Falmouth	By submarine, North Sea, Aug. 19, 1916.
Intrepid, Iphigenia	Sunk as blockships, Zeebrugge, Apr. 23, 1918.
Nottingham	By submarine, North Sea, Aug. 19, 1916.
Pathfinder	By submarine, North Sea, Sept. 5, 1914.
Pegasus	Sunk by Königsberg, Zanzibar, Sept. 20, 1914.
Sirius	Sunk as blockship, Ostend, Apr. 23, 1918.
Thetis	Sunk as blockship, Zeebrugge, Apr. 23, 1918.
Vindictive	Sunk as blockship, Ostend, May 10, 1918.

Torpedo Gunboats.

Hazard	By collision, English Channel, Jan. 28, 1918.
Jason	By mine, Apr. 7, 1917.
Niger	By submarine, off Deal, Nov. 11, 1914.
Seagull	By collision, Firth of Clyde, Sept. 30, 1918.
Speedy	By mine, Sept. 3, 1914.

Monitors.

Raglan	Sunk in action, Mediterranean, Jan. 20, 1918.
M 15	By submarine, Mediterranean, Nov. 11, 1917.
M 21	By mine, off Ostend, Oct. 20, 1918.
M 28	In action, Mediterranean, Jan. 20, 1918.
M 30	Sunk in Mediterranean, May 13, 1916.

Coast Defence Ship.

Glatton	Sunk by explosion, Dover Harbour, Sept. 16, 1918.

Sloops.

Alyssum	By mine, off S.W. coast of Ireland, Mar. 18, 1917.
Anchusa	By submarine, off N. coast of Ireland, July 16, 1918.
Arabis	By T.B., North Sea, Feb. 10, 1916.
Arbutus	By submarine, Irish Sea, Dec. 16, 1917.
Aster	By mine, Mediterranean, July 4, 1917.
Begonia	Probably sunk by submarine, Atlantic, Oct. 1917.
Bergamot	By submarine, Atlantic, Aug. 13, 1917.
Candytuft	By submarine, Mediterranean, Nov. 18, 1917.
Cowslip	By submarine, off Cape Spartel, Apr. 25, 1918.
Gaillardia	By mine, North Sea, Mar. 22, 1918.
Genista	By submarine, Atlantic, Oct. 23, 1916.
Lavender	By submarine, English Channel, May 5, 1917.
Mignonette	By mine, off S.W. coast of Ireland, Mar. 17, 1917.
Nasturtium	By mine, Mediterranean, Apr. 27, 1916.
Primula	By submarine, Mediterranean, Mar. 1, 1916.
Rhododendron	By submarine, North Sea, May 5, 1918.
Salvia	By submarine, off W. coast of Ireland, June 20, 1917.
Tulip	By submarine, Atlantic, Apr. 30, 1917.

River Gunboats.

Comet and Shaitan	Sunk in River Tigris, Nov., 1915.

Flotilla Leaders.

Hoste	By collision, North Sea, Dec. 21, 1916.
Scott	By submarine, North Sea, Aug. 15, 1916.
Tipperary	In action, North Sea, May 31, 1916.

Destroyers.

Ardent	In Jutland Battle, May 31, 1916.
Ariel	By mine, North Sea, Aug. 2, 1918.
Arno	By collision, Mediterranean, March 23, 1918.
Attack	By mine off Alexandria, Dec. 30, 1917.
Bittern	By collision, English Channel, April 4, 1918.
Boxer	By collision, English Channel, Feb. 8, 1918.
Cheerful	By mine off Shetland Islands, June 30, 1917.
Comet	By mine, Mediterranean, Aug. 6, 1918.
Contest	By submarine, English Channel, Sept. 18, 1917.
Coquette	By mine, North Sea, March 7, 1916.
Derwent	By mine, English Channel, May 2, 1917.
Eden	By collision, English Channel, June 18, 1916.
Fairy	Sunk after ramming enemy submarine, North Sea, May 31, 1918.
Falcon	By collision, North Sea, April 1, 1918.
Flirt	In action, Straits of Dover, Oct. 27, 1916.
Fortune	In Jutland Battle, May 31, 1916.
Foyle	By mine, Dover Straits, March 15, 1917.

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GREAT BRITAIN—*continued.*

Destroyers—continued.

Ghurka	By mine, English Channel, Feb. 8, 1917.
Goldfinch	Wrecked.
Itchen	By submarine, North Sea, July 6, 1917.
Kale	By mine, North Sea, March 27, 1918.
Laforey	Lost, English Channel, March 23, 1917.
Lassoo	By mine, North Sea, Aug. 13, 1916.
Lightning	By mine, North Sea, June 30, 1916.
Louis	Wrecked off Gallipoli, November, 1915.
Lynx	By mine off Moray Firth, Aug. 9, 1915.
Maori	By mine, North Sea, May 7, 1915.
Marmion	By collision, North Sea, Oct. 21, 1917.
Mary Rose	In action, North Sea, Oct. 17, 1917.
Medusa	By collision, North Sea, March 25, 1916.
Myrmidon	By mine, English Channel, March 26, 1917.
Narborough	Wrecked off Orkneys, January 12, 1918.
Negro	By collision, North Sea, Dec. 21, 1916.
Nessus	By collision, North Sea, Sept. 8, 1918.
Nestor	In Jutland Battle, May 31, 1916.
Nomad	In Jutland Battle, May 31, 1916.
North Star	In action, Zeebrugge, April 23, 1918.
Opal	Wrecked off Orkneys, Jan. 12, 1918.
Paragon	In action, Dover Straits, March 18, 1917.
Partridge	In action, North Sea, Dec. 12, 1917.
Pheasant	Lost off Orkneys, March 1, 1917.
Phœnix	By submarine, Mediterranean, May 14, 1918.
Pincher	Wrecked on Seven Stones, July 24, 1918.
Racoon	Wrecked on Irish Coast, Jan. 9, 1918.
Recruit (old)	By submarine off Galloper, May 1, 1915.
Recruit	By mine, North Sea, Aug. 9, 1917.
Setter	By collision, North Sea, May 17, 1917.
Shark	In Jutland Battle, May 31, 1916.
Simoon	In action, North Sea, Jan. 23, 1917.
Sparrowhawk	In Jutland Battle, May 31, 1916.
Staunch	By submarine, Mediterranean, Nov. 11, 1917.
Strongbow	In action, North Sea, Oct. 17, 1917.
Surprise	By mine, North Sea, Dec. 23, 1917.
Success	Wrecked off Fifeness, Dec. 27, 1914.
Tornado	By mine, North Sea, Dec. 23, 1917.
Torrent	By mine, North Sea, Dec. 23, 1917.
Turbulent	In Jutland Battle, May 31, 1916.
Ulleswater	By submarine, North Sea, Aug. 15, 1918.
Ulysses	By collision, Firth of Clyde, Oct. 29, 1918.
Vehement	By mine, North Sea, Aug. 2, 1918.
Velox	By mine off Nab Light, Oct. 25, 1915.
Wolverine	By collision off Irish Coast, Dec. 12, 1917.

Torpedo Boats.

046	Sunk, Dec. 27, 1915.
9	By collision, North Sea, July 26, 1916.
10	By submarine, North Sea, June 10, 1915.
11	By mine, North Sea, March 7, 1916.
12	By submarine, North Sea, June 10, 1915.
13	By collision, North Sea, Jan. 26, 1916.
24	Wrecked off Dover, Jan. 28, 1917.
90	Capsized and sank, Straits of Gibraltar, April 25, 1918.
96	In collision off Gibraltar, Nov. 1, 1915.
117	In collision, English Channel, June 10, 1917.

Submarines.

A.E. 1	Sunk by accident, Sept., 1914.
A.E. 2	Sunk, Dardanelles, May, 1915.
C 3	Blown up at Zeebrugge Mole, April 23, 1918.
C 26	Destroyed at Helsingfors, April 8, 1918.
C 27	Destroyed at Helsingfors, April 8, 1918.
C 29	By mine, Aug. 29, 1915.
C 31	Lost off Belgian Coast about Jan. 5, 1915.
C 32	Lost in Baltic, Oct., 1917.
C 33	Lost in North Sea about Aug. 7, 1915.
C 34	By submarine, North Sea, about July 19, 1917.
C 35	Destroyed at Helsingfors, April 8, 1918.
D 2	Lost, North Sea, Dec. 1, 1914.
D 3	Sunk, English Channel, March 12, 1918.

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GREAT BRITAIN—*continued.*

Submarines—continued.

D 5 . By mine, North Sea, Nov. 3, 1914.
D 6 . Lost in July, 1918.
E 1 . Destroyed at Helsingfors, April 8, 1918.
E 3 . Sunk, North Sea, Oct. 18, 1914.
E 5 . Lost.
E 6 . By mine, Dec. 26, 1915.
E 7 . Lost in Dardanelles, Sept. 1915.
E 8 . Destroyed at Helsingfors, April 8, 1918.
E 9 . Destroyed at Helsingfors, April 8. 1918.
E 10 . Lost, North Sea, about Jan. 21, 1915.
E 13 . Wrecked off Saltholm, Aug. 18, 1915. Interned.
E 14 . Sunk, Dardanelles, Jan. 28, 1918.
E 15 . Wrecked, Dardanelles, April, 1915.
E 16 . Lost, North Sea, Aug. 22, 1916.
E 17 . Wrecked, Jan., 1916.
E 18 . Lost in Baltic, May, 1916.
E 19 . Destroyed at Helsingfors, April 8, 1918.
E 20 . Sunk, Dardanelles, Nov., 1915.
E 22 . Sunk, North Sea, April 25, 1916.
E 24 . Lost.
E 26 . Lost, North Sea, July 6, 1916.
E 30 . Lost, North Sea, Nov., 1916.
E 34 . Lost, North Sea, July, 1918.
E 36 . Lost, North Sea, Jan. 13, 1917.
E 37 . Lost, North Sea, Dec., 1916.
E 47 . Lost, North Sea, Aug., 1917.
E 49 . Lost, off Shetlands, March, 1917.
E 50 . Lost, North Sea, Feb., 1918.
G 7 . Lost, North Sea, Nov., 1918.
G 8 . Lost, North Sea, Jan., 1918.
G 9 . By accident, North Sea, Sept. 18, 1917.
G 11 . Wrecked off Howick, Nov. 22, 1918.
H 3 . Lost, Adriatic, July 15, 1916.
H 5 . By collision, Irish Sea, March 2, 1918.
H 6 . Wrecked, Jan., 1916.
H 10 . Lost, North Sea, Jan, 1918.
J 6 . By accident, North Sea, Oct. 15, 1918.
K 1 . By collision, North Sea, Nov. 18, 1917.
K 4 . By collision, North Sea, Jan. 31, 1918.
K 17 . By collision, North Sea, Jan. 31, 1918.
L 10 . Lost, North Sea, Oct., 1918.

Aircraft Carriers.

Ben-my-Chree By gunfire off Asia Minor, Jan. 11, 1917.
Campania . By collision, Firth of Forth, Nov., 1918.
Hermes . . By submarine, Straits of Oct. 31, 1914.

Patrol Boats.

P 12 . . By collision, English Channel, Nov. 4, 1918.
P 26 . . By mine, English Channel, April 10, 1917.

Mine-layers.

Ariadne . . By submarine, English Channel, July 26, 1917.
Princess Irene Blown up, Sheerness, May 27, 1915.

17 *Armed Merchant Cruisers.*

Hospital Ships.

Rewa. . . By submarine, Bristol Channel, Jan. 4, 1918.
Rohilla . . Wrecked off Whitby, Oct. 30, 1914.

13 *Armed Boarding Steamers.*

2 *Mine-sweepers.*

LOSSES OF THE ALLIES.

FRANCE.

Battleships.

Bouvet . . By mine, Dardanelles, Mar. 18, 1915.
Suffren . . By submarine on passage from Gibraltar to Lorient, Nov. 26, 1916.
Gaulois . . By submarine, Mediterranean, Dec. 27, 1916.
Danton . . By submarine, Mediterranean, Mar. 19, 1917.

Cruisers.

Léon Gambetta By Austrian submarine, Straits of Otranto, night Apr. 26-27, 1915.
Amiral Charner By submarine, off coast of Syria, Feb. 8, 1916.
Kléber . . By mine, off Cape St. Mathieu, June 27, 1917.
Châteaurenault By submarine, Mediterranean, Dec. 14, 1917.
Dupetit-Thouars By submarine, Atlantic, Aug. 7, 1918.

Gunboats.

Zélée . . Reported sunk off Papeete, Tahiti, by Scharnhorst and Gneisenau, Sept. 22, 1914.
Surprise . . By submarine, Funchal, Dec. 3, 1916.

Sloop.

Rigel . . By submarine, off Algiers, Oct. 2, 1916.

Destroyers.

Mousquet . Sunk at Penang by Emden, Oct. 28, 1914.
Dague . . Reported sunk, Antivari, Feb. 24, 1915.
Branlebas . By mine, off coast of Flanders, about Nov. 9, 1915.

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FRANCE—*continued.*

Destroyers—continued.

Renaudin	By submarine, Adriatic, Mar. 18, 1916.
Fantassin	By collision, Mediterranean, June 5, 1916.
Fourche	By submarine, Straits of Otranto, June 23, 1916.
Yatagan	By collision, Channel, Dec. 3, 1916.
Etendard	By torpedo, Apr. 25, 1917.
Boutefeu	Blown up off Brindisi, May 15, 1917.
Faulx	By collision, Straits of Otranto, Mar. 10, 1918.
Catapulte	By collision near Bizerta, May 18, 1918.

Torpedo Boats.

347	By collision, Toulon, Oct. 9, 1914.
348	Sunk, Oct., 1914.
319	By mine, Jan., 1915.
331	Sunk, June 17, 1915.
300	By mine, Feb. 1, 1916.
317	By mine, Dec. 28, 1916.
333	By collision, Western Mediterranean, Mar. 12, 1918.

Submarines.

Curie	Sunk at Pola, Dec. 23, 1914. Raised by Austrians. Returned to France, Nov. 1918.
Saphir	Reported sunk, entrance to Dardanelles, Jan. 16, 1915.
Joule	Reported sunk, Dardanelles, May, 1915.
Mariotte	Sunk, Dardanelles, July 26, 1915.
Turquoise	Reported by Turks as sunk, Oct. 30, 1915. Salved and returned to French, Dec., 1918.
Fresnel	Destroyed by Austrian T.B.D. whilst aground, Adriatic, Dec. 5, 1915.
Monge	Sunk, Adriatic, Dec. 29, 1915.
Foucault	Sunk by Austrian seaplanes, Adriatic, Sept., 1916.
Ariane	Torpedoed when leaving Bizerta, June 19, 1917.
Bernouilli	Lost, Adriatic, about Feb. 13, 1918.
Diane	Lost, English Channel, about Mar. 10, 1918.
Prairial	By collision, off Havre, night Apr. 28–29, 1918.
Floréal	By collision, Ægean, Aug. 2, 1918.
Circé	By torpedo, off Cape Rodoni, Sept. 20, 1918.

Mine-layers.

Casabianca	By mine, Ægean, night June 3–4, 1915.
Cassini	By submarine, Mediterranean, Feb. 28, 1917.

Armed Merchant Cruisers Indien, Provence II., Burdigala, Golo II. By submarine attack, Mediterranean, 1915–1917.

RUSSIA.

Battleships.

Svobodnaya Rossiya	Destroyed in Black Sea to avoid internment, June 18, 1918.
Imperatritza Mariya	Blown up, Sevastopol, Oct. 20, 1916.
Peresviet	By mine, near Port Said, Jan. 4, 1917.
Slava	In action, Gulf of Riga, night Oct. 16–17, 1917.

Cruisers.

Pallada	By submarine, Baltic, Oct. 12, 1914.
Prut (*ex* Medjidieh)	Captured, Sevastopol, May, 1918.

Light Cruiser.

Zhemchug	Sunk, Penang, by Emden, Oct. 28, 1914.

Gunboats.

Sivouch	Sunk by German Cruiser, between Riga and Moon Sound, Aug. 19, 1915.
Bobyr	Captured off Abo, April 1918.

Armed Mine-layers.

Vasilii Velikii	Lost, Vaida Bay (White Sea), April, 1616.
Prut	Sunk off Sevastopol, Oct. 29, 1914.
Enisei	By submarine, off Gran Grund Bank, Baltic, June 4, 1915.
Ladoga	By submarine, entrance to Gulf of Finland, Aug. 15, 1915.

Destroyers.

Letuchi Ispoluitelni	Foundered, Gulf of Finland, Dec. 16, 1914.
Leit. Pushchin	By German submarine, off Varna, Mar. 9, 1916.
Zhivuchi	By mine, off Sevastopol, April 28, 1916.
Dobrovoletz	By mine, Swalfer Ort, Aug. 21, 1916.
Kazanetz	By submarine, off Odensholm, Oct. 28, 1916.
Leit. Zatzarenni	By mine, off Sulina, July 1, 1917.
Leit. Burakov	By mine, off Mariehamn, Aug. 13, 1917.
Okhotnik	By mine, Gulf of Riga, Sept. 26, 1917.
Grom	In action, Gulf of Riga, Oct. 14, 1917.

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RUSSIA—*continued.*

Destroyers—continued.

Bditelni	By mine, off Mantyluoto, Nov. 27, 1917.
Gnyevni	Blown up, Sevastopol, May, 1918.
Pronsitelni, Gadvibey, Fiodonnissi, Kaliakra, Leit. Shestakoff, Leit. Kapt. Baranov, Smyetlivi, Stremitelni, Kertch	Partially destroyed and sunk in Black Sea to avoid internment, June, 1918.

Submarines.

Akula	Lost, Baltic, Nov., 1915.
Bars	Lost, Baltic, June, 1917.
Morzh	Lost, Black Sea, June, 1917.
Lvitza	Lost, Baltic, July, 1917.
A G 14	Lost, Baltic, Sept., 1917.
Gepard	Lost, Baltic, Oct., 1917.
A G 11, 12, 13, 15	Destroyed, Hango, to avoid capture, April, 1918.
Edinerog	Sunk, Reval Harbour, Feb., 1918.
Ugor	Lost in ice, off Reval, Feb., 1911.

Hospital Ships.

Portugal, Vperyed, by submarines, Black Sea, March 30, 1916, and July 10, 1916; Russ, in Baltic, May, 1918.

JAPAN.

Battleship.

Kawachi	Blown up, Tokuyama Bay, July 12, 1918.

Battle Cruisar.

Tsukuba	Blown up, Yokosuka Harbour, Jan. 14, 1917.

Light Cruisers.

Takachiho	Torpedoed, Kiaochau Bay, by S 90, Oct. 18, 1914.
Kasagi	Wrecked, July, 1916.
Otowa	Wrecked, July, 1917.

Destroyers.

Shirotaye	Wrecked, Sept., 1914. Raised, but will not be employed again.
Tokitsukaze	Wrecked, Coast of Kyushu, March 25, 1918.

Torpedo Boat.

33.	By mine, Kiaochau Bay, Nov. 11, 1914.

ITALY.

Battleships.

Benedetto Brin	Destroyed by explosion, Brindisi, Sept. 27, 1915.
Leonardo da Vinci	Sunk after explosion on board, Taranto, Aug. 2, 1916 (to be raised).
Regina Margherita	Blown up, Italian mine-field, Dec. 11, 1916.

Cruisers.

Amalfi, G. Garibaldi	By Austrian submarine, Adriatic, July 7, 1915.

Auxiliary Cruisers—Città di Palermo and Città di Messina.

Mining Vessel.

Partenope	By submarine, off Bizerta, March 24, 1918.

Monitor.

A. Capellini	Capsized and sunk off Ancona, Nov. 14, 1918.

Flotilla Leader.

C. Rossarol	By mine, near Pola, Nov. 18, 1918.

Destroyers.

Turbine	In Adriatic, by T.B.D., May 24, 1915.
Intrepido	By mine, near Valona, Dec. 4, 1915.
Impetuoso	By submarine, Straits of Otranto, July 10, 1916.
Audace	By collision, off Cape Colonna, Aug. 29, 1916.
Nembo	By submarine, Adriatic, Oct. 16, 1916.
Borea	Sunk by Austrian Light Cruiser, May 15, 1917.
B. Cairoli	By collision, April 10, 1918.
Garibaldino	By collision, July 16, 1918.

Torpedo Boats.

5 P N	By submarine, Adriatic, June 26, 1915.
17 O S	Damaged by explosion, Adriatic, and destroyed by the Italians, July 2, 1915.
Serpente	By mine, about June, 1916.
Perseo	By collision, March, 1917.

Submarines.

Medusa	By submarine, Adriatic, June 9, 1915.
Nereide	By submarine, Adriatic, Aug. 15, 1915.
Jalea	Probably by mine, Gulf of Trieste, Aug. 10, 1915.
Balilla	Sunk in Adriatic, July 14–15, 1916.
G Pullino	Captured by the Austrians, Adriatic, July, 1916.
A. Guglielmotti	Sunk by accident, March 10, 1917.
W. 4	Lost, Adriatic, Aug. 3–11, 1917.
H. 5.	Sunk by accident, April 16, 1918.

Gunboat.

Archimede	Captured by Germans at Odessa, June, 1918. Recaptured Dec., 1918.

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ITALY—*continued.*

Transport.

Sterope . . By submarine, April 7, 1918.

PORTUGAL.

River Gunboat Tete destroyed by explosion, Zambesi River, Feb., 1917.

ROUMANIA.

Torpedo Boat Smeul capsized and sunk, Black Sea, May 17, 1917.

GREECE.

Destroyer Doxa sunk by submarine, June 27, 1917.

UNITED STATES.

Cruiser.

San Diego . By mine off Fire Island, July 19, 1918.

Destroyers.

Chauncey . By collision, Atlantic, Nov. 19, 1917.

Jacob Jones. By submarine off Scillies, Dec. 6, 1917.

Gunboat Schurz sunk in collision, June 21, 1918.

Submarine F 1 sunk in collision, Dec. 17, 1917.

Armed Yachts Alcedo and Wakiva II. *Armed Trawlers* Bauman and Rehoboth. *Fuel Ship* Cyclops lost in W. Atlantic.

The battleship Minnesota was mined, Sept. 29, 1918, but reached port. The armoured cruisers Milwaukee and Tennessee were wrecked and have been removed from the lists.

LOSSES OF ENEMY POWERS.

GERMANY.

Battleship.

Pommern . Sunk in Jutland Battle May 31-June 1, 1916.

Battle Cruiser.

Lützow . . Sunk in Jutland Battle, May 31-June 1, 1916.

Cruisers.

Yorck . . By mine off the Jade, Nov. 4, 1914.

Friedrich Karl Reported sunk by mine, Baltic, Nov. 25, 1914.

Scharnhorst, Gneisenau . In action, Falkland Islands, Dec. 8, 1914.

Blücher . . In Dogger Bank Battle, Jan. 24, 1915.

Prinz Adalbert. In Baltic by British submarine, Oct. 23, 1915.

Light Cruisers.

Magdeburg . Destroyed, Gulf of Finland, Aug. 20, 1914.

Mainz . ., Köln . . ., Ariadne . . In Heligoland Bight action, Aug. 28, 1914.

Hela . . . By submarine, off Heligoland, Sept. 13, 1914.

Emden . . Destroyed at Cocos Island, Nov. 9, 1914.

Karlsruhe . By explosion on board; sank in lat. 10° 7′ N., long. 55° 25′ W., Nov. 4, 1914.

Leipzig . ., Nürnberg . In action near Falkland Islands, Dec. 8, 1914.

Dresden . . Sunk near Juan Fernandez Island, March 14, 1915.

Königsberg . Destroyed in Rufigi River, July 11, 1915.

Undine . . By British submarine, Baltic, Nov. 7, 1915.

Bremen . . Sunk in Eastern Baltic, Dec. 17, 1915.

Wiesbaden ., Rostock . ., Frauenlob ., Elbing . . Sunk in Jutland Battle, May 31-June 1, 1916.

32 *Mining Vessels.*

Gunboats.

Iltis, Jaguar, Luchs, Tiger, Cormoran, Tsingtau, Nov. 7, 1914. All these had been sunk.

Eber . . . Interned, Bahia, Sept. 5, 1914. Burnt and sunk by Germans, Oct. 26, 1917.

Geier . . Interned, Honolulu, Nov. 9, 1914.

Seeadler . Blown up, Wilhelmshaven, April, 1917.

Destroyers.

10 *Destroyers* were sunk in 1914; 10 in 1915; 16 in 1916; 11 in 1917; 22 in 1918.

53 *Torpedo Boats*, 1915 to 1918.

5 *Submarines* destroyed in 1914; 19 in 1915; 25 in 1916; 66 in 1917; 82 in 1918.

Losses after Armistice.

U 157 . . Interned, Norway, Nov. 11, 1918.

U C 74 . . Interned, Barcelona, Nov. 21, 1918.

U 97 . . . Sunk, North Sea, on way over to surrender, Nov. 21, 1918.

AUSTRIA-HUNGARY.

Battleships.

Szent Istvan By torpedo from Italian M.L., off Premuda Island, June 10, 1918.

Wien. . . By torpedo from Italian M.L., Trieste Harbour, night Dec. 9-10, 1917.

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AUSTRIA-HUNGARY—*continued.*

Battleships—continued.

Viribus Unitis	By external explosion, Pola Harbour, Nov. 1, 1918.

Light Cruisers.

Zenta . .	Sunk by the French, Aug. 16, 1914.
Kaiserin Elisabeth	Sunk, Tsingtau (see note concerning German gunboats).

Destroyers.

Lika (old) .	By mine, Adriatic, Dec. 29, 1915.
Triglav (old)	By mine and gunfire, Adriatic, Dec. 29, 1915.
Wildfang .	By mine, Adriatic, middle of June, 1917.
One (Streiter)	In Durazzo Harbour by British aircraft, May 27, 1918.
26 . . .	By mine, off Pola, Aug. 23, 1914.

Torpedo Boats.

22 . . .	Sunk, Adriatic, March, 1916 (French report).
11 . . .	Surrendered to Italians, Adriatic, Oct. 5, 1917.
One . . .	By torpedo from Italian M.L., off Durazzo, May 13, 1918.
One . . .	In action, Gulf of Drin, Sept. 5, 1918.

8 *Submarines* and probably others.

River Monitors.

Temes . .	Reported to have been mined in the Save, Oct. 23, 1914. Reported raised and taken to Budapest for repairs about July, 1916.
Körös . .	Torpedoed by British picket boat, Danube, Apr. 22, 1915. Subsequently salved.
Inn . . .	Sunk by a mine, Danube, Sept. 22, 1917. Raised, Jan., 1918.

Patrol Boat C destroyed by gunfire, Belgrade, May 15, 1915.

TURKEY.

Battleship.

Kehyr-ed-Din Barbarossa	By British submarine, near Gallipoli, Aug. 8, 1915.

Armoured Vessel.

Messoudieh .	By submarine B 11, Dardanelles, Dec. 13, 1914.

Light Cruisers.

Medjidieh .	By mine, Black Sea, Apr. 3, 1915. Salved by Russians, 1915. Recaptured by Turkey, May, 1918.
Midillieh (*ex* Breslau)	By mine, south of Imbros, Jan. 25, 1918.

Gunboats.

Marmariss .	Set on fire and run ashore, Tigris, June 2, 1915.
Tash Kupru. Yozgad . .	Sunk by three Russian destroyers, Black Sea. Dec. 10, 1915.
Nour-el-Bahir	sunk, cause and date unknown.

Torpedo Vessel.

Pelenki Deryá	By submarine, May 23, 1915.

Destroyers.

Yar Hissar .	By British submarine, Sea of Marmora, Dec. 3, 1915.
Gyret i Vataniye	Wrecked off Baljik, May, 1917.

Torpedo Boats.

Demir Hissar	Driven ashore, Chios, Apr. 17, 1915. Crew interned.
One (Kutahaya class)	Blown up, Bosphorus, Sept., 1916.
Two . . .	Sunk by Mercury, off Bosphorus, Dec., 1916.
Hamid Abad	Sunk by Russian T.B.D.s, Black Sea, Oct. 20, 1917.

German Submarines with Turks.

One . . .	Destroyed by Russians, Black Sea, Jan. 10, 1916.
U B 7 . .	Lost, Black Sea, Oct., 1916.

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FOUR YEARS OF MILITARY OVERSEAS TRANSPORT.

THE transport of the armies and of all that the armies have required for their service in many theatres of hostilities has been the greatest triumph of the war. But for the work of the Mercantile Marine, and the command of the sea and the protection of naval forces in patrol, escort, and convoy, which made this transport possible, the war could not have been won. The following statistics of oversea transport during four years of the war are, therefore, given here. They are summarised from a large volume of returns kindly placed at the disposition of the Editors by the Ministry of Shipping.

I.

SUMMARY OF TOTAL *PERSONNEL* CARRIED.

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
United Kingdom to France	1,224,257	3,154,743	5,705,190	9,337,395
France to United Kingdom	335,696	1,311,583	2,896,032	5,499,809
United Kingdom to Overseas	273,743	601,880	785,066	968,228
Overseas to United Kingdom	180,533	499,532	842,121	1,766,974
Overseas to ports other than France	354,745	1,459,281	2,414,813	3,682,172
Coastwise moves	158,414	182,485	217,471	235,471
Total	2,517,388	7,209,224	12,860,693	21,490,049
Exchange of prisoners . .	—	—	—	12,631

The following are details of transport, amplifying the above table and some of the succeeding tables, from the beginning of the war up to March 2, 1919. *Personnel*—effectives, 23,388,228; non-effectives, 2,336,241; prisoners, including sick and wounded, 192,899; animals, 2,264,134; vehicles, 512,400; British military stores, 47,992,839 tons; Allied military stores, 4,964,811 tons.

COASTWISE TRANSPORT IN FRANCE AND BELGIUM BEFORE AUGUST, 1915.

Evacuation of Havre and Rouen: British troops, 21,000; Allied troops, 42,000; horses, 9000; stores, 60,000 tons.

Evacuation of Zeebrugge and Ostend: British troops, 440; Allied troops, 33,400; stores, 8000 tons.

Allied refugees: French, 2000 (London to La Pallice); Belgian, 2000; Russian, 1000.

Coastwise transport in the United Kingdom: To August, 1915, 56,574; August, 1916, 80,654; August, 1917, 105,788; 1918, 123,788. Also over 19,000 prisoners, about 50,000 animals, and over 14,000 vehicles.

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II.

COMPARATIVE STATEMENT OF THE *PERSONNEL*, ANIMALS, STORES, ETC., CARRIED OVERSEAS FROM AUGUST 9, 1914, TO THE END OF AUGUST, 1915, 1916, 1917, AND 1918.

CROSS-CHANNEL TRANSPORT.

	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
UNITED KINGDOM TO FRANCE:				
Officers	42,632	91,442	162,887	263,032
Other Ranks	1,100,367	2,309,807	3,763,146	4,862,475
Leave Men	58,694	706,793	1,443,245	2,943,249
Belgians	9,714	31,261	210,427	281,311
Nurses	2,850	5,440	21,496	30,755
Royal Navy	10,000	10,000	19,184	61,516
United States Army—				
Officers and Men	—	—	10,557	686,054
Nurses	—	—	675	4,947
Other Allies	—	—	9,400	40,976
Labour Batts. (Chinese, South African and Fijian)	—	—	41,735	109,817
Women's Auxiliary Army Corps and Red Cross, Relatives of Wounded, etc.	—	—	22,438	53,263
Total *Personnel*	1,224,257	3,154,743	5,705,190	9,337,395
FRANCE TO UNITED KINGDOM:				
Officers and Men (including leave men)	59,782	585,775	1,481,010	3,118,417
Royal Navy	7,200	7,820	12,585	63,097
Allies (including sick and wounded)	17,572 (approx.)	62,593	153,746	235,055
Sick and Wounded (British and Colonial)	240,156	631,554	1,199,704	1,912,509
Nurses, Civilians, etc.	988	1,280	3,044	84,789
Total	325,698	1,289,022	2,850,089	5,413,867
Prisoners—				
Wounded	2,034	4,871	18,283	31,913
Not Wounded	7,973	17,699	27,660	54,029
Total	10,007	22,561	45,943	85,942

III.

MOVEMENT OF *PERSONNEL* FROM OVERSEAS TO THE UNITED KINGDOM.

1. BRITISH TROOPS (EFFECTIVES).

From	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918
Australia and New Zealand	832	26,670	132,388	164,398
Canada, Newfoundland, and U.S.A. (including Bermuda and West Indies)	85,051	223,450	347,556*	452,135*
Mediterranean and India and Far East	48,674	80,886	93,598	96,134
South and West Africa	7,042	18,706	27,256	38,497
Russia	—	—	—	199
Total	141,599	349,712	600,798	752,363

* Including 120 Fijians.

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III.—*continued.*

2. Allied Troops and Labour Battalions (Effectives).*

From	Nature of Troops.	End of August, 1917.	End of August, 1918.
Canada	Allies	1,703	4,738
	Other Allies	—	766
U.S.A.	Americans	13,789	693,890†
Miscellaneous Ports	Allies	2,128	2,566
China and Japan	Chinese Coolies	34,349	91,529
South Africa	Natives	3,393	9,783
	Total	55,362	803,272

* All moved after August, 1916, with the exception of 120 Belgians from Canada.
† In addition to above 46,805 Americans, 617 Civilians, etc., and 40 British were carried in American ships.

IV.

TRANSPORT OF THE UNITED STATES ARMY.

—	United Kingdom to France.	U.S.A. to United Kingdom.		U.S.A. to France.
	—	British Tonnage.	American Tonnage.	British Tonnage.
1917				
May	—	258	252	—
June	1,801	1,210	529	—
July	2,166	1,996	554	—
August	7,265	8,300	1,232	—
September	15,560	12,279	726	—
October	19,527	23,189	1,038	—
November	15,547	10,278	862	—
December	16,904	16,518	8,613	—
1918				
January	24,674	20,295	2,194	—
February	8,390	5,119	829	—
March	15,074	18,638	9,499	—
April	31,421	36,062	3,421	—
May	88,452	113,470	3,554	8,939
June	140,110	120,421	2,243	12,621
July	184,814	194,141	9,409	4,473
August	119,296	116,361	2,507	24,133
September	148,038	138,784	—	19,055
October	119,632	118,307	—	17,496
November	49,979	28,430	7,564	23,676
December	7,081	697	—	13,516
Total	1,015,731	984,753	55,026	

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V.

BRITISH *PERSONNEL* FROM OVERSEAS TO PORTS OTHER THAN UNITED KINGDOM PORTS.

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
Local Movements.				
1. Moves in Red Sea and Suez Canal, India to Aden and Perim . . .	8,975	22,958	28,802	40,946
2. *To Egypt*—				
From Australia	69,918	169,940	175,240	180,927
,, Salonika	—	3,825	36,020	69,489
,, Ceylon	230	230	230	230
,, Persian Gulf . . .	—	—	—	7,742
,, East Africa and Mauritius . . .	—	280	1,536	1,593
,, South Africa . .	—	—	—	912
,, Italy	—	—	5,607	57,720
,, Mudros and Cyprus.	220	150,510	150,510	150,703
,, New Zealand. . .	17,456	40,090	40,505	40,638
,, West Indies . . .	—	410	410	410
,, Malay States. . .	—	—	—	139
Totals	87,824	365,285	410,058	510,503
3.* From Egypt, Italy, Malta, and Marseilles to Salonika and Mudros . . .	220	139,290	234,280	274,108
4.* *To Salonika, Egypt, and Mudros* (not included in the above)—				
From India, Malta, Gibraltar, and Marseilles .	64,434	143,165	241,653	371,770
5. *To India*—				
From Egypt and Red Sea, Italy, East Africa, Hong Kong, Marseilles, New Zealand, Salonika, South Africa, and Persian Gulf	2,420	19,124	52,857	120,446
Including from Egypt and the Red Sea	—	(10,780)	(20,163)	(56,110)
6. *To the Persian Gulf*—				
From East Africa, Egypt, India, Italy, Marseilles, and South Africa . .	52,312	243,570	539,741	811,976
Including from India . .	(48,250)	(159,090)	(422,499)	(682,688)
7. *To Marseilles*—				
From Australia, Hong Kong, Egypt, India, Malta, Gibraltar, Salonika, Mudros, and Italy . .	92,895	345,290	396,903	428,453
Including from Egypt . .	(2,662)	(237,620)	(259,136)	(289,939)
,, ,, India . .	(86,415)	(94,720)	(116,281)	(116,281)

* 3 and 4 include troops moved to and from the Dardanelles and Cyprus.

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V.—*continued.*

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
8. *Other African Movements*— From Beira to East Africa, East Africa to Beira, South Africa to East Africa, East Africa to South Africa, Mauritius to East and South Africa, and West Africa to East Africa	480	40,330	179,975	362,493
9. *To East and South Africa*—				
From Egypt	—	2,670	2,870	4,537
„ India	22,494	30,470	42,380	66,550
„ Marseilles . . .	—	—	44	57
Totals	22,494	33,140	45,294	71,144

VI.

SUMMARY OF ANIMALS CARRIED OVERSEAS.

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
United Kingdom to France	265,432	493,355	659,074	776,560
France to United Kingdom	873	1,080	1,396	1,697
United Kingdom to Overseas	39,072	71,100	77,369	79,505
Overseas to United Kingdom	279,096	399,549	529,747	611,805
Overseas to ports other than France	101,844	354,628	509,669	667,910
Coastwise moves	18,215	20,968	23,268	23,268
Total	704,532	1,340,680	1,800,523	2,160,746

VII.

SUMMARY OF VEHICLES CARRIED.

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
United Kingdom to France .	79,455	176,386	326,002	428,763
France to United Kingdom .	658	2,834	4,159	3,048
United Kingdom to Overseas	440	6,791	15,206	20,056
Overseas to United Kingdom	924	1,974	2,487	2,487
Overseas to ports other than France	2,480	10,925	17,902	26,009
Coastwise moves	2,811	3,713	3,853	3,854
Totals	88,768	202,623	369,609	484,217

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VIII.

SUMMARY OF STORES (TONS) CARRIED.

—	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
United Kingdom to France .	1,068,204	3,881,235	11,736,555	21,848,092
France to United Kingdom .	20,658	111,750	243,005	763,924
United Kingdom to Overseas	180,000	562,337	1,050,435	1,241,461
Overseas to United Kingdom	32,830	861,625	4,634,080	6,633,322
Overseas to ports other than France	93,251	3,119,700	8,369,648	15,889,480
Coastwise moves	68,411	69,331	72,445	72,445
Totals	1,463,354	3,605,978	26,106,168	46,448,724

IX.

CROSS CHANNEL: ANIMALS, STORES, VEHICLES, ETC.

	End of August, 1915.	End of August, 1916.	End of August, 1917.	End of August, 1918.
UNITED KINGDOM TO FRANCE:				
Animals	265,432	493,355	659,074	776,560
Stores—	Tons.	Tons.	Tons.	Tons.
Ammunition, etc. . .	76,312	676,763	2,507,193	4,601,944
Supplies, etc.	989,892	3,125,242	8,571,140	16,204,211
Allied Stores	—	79,230	658,222	1,036,937
Totals	1,068,204	3,881,235	11,736,555	21,848,092
Vehicles—				
Guns	2,569	17,081	38,240	42,156
Aeroplanes	29	344	1,126	2,693
Tanks	—	—	631	1,891
Railway Wagons, etc. .	395	604	15,209	31,994
French Vehicles . . .	—	—	142	142
Other Vehicles . . .	76,462	158,357	270,636	349,887
Totals	79,455	176,386	326,002	428,763
FRANCE TO UNITED KINGDOM:				
Animals	873	1,080	1,396	1,697
Vehicles—				
Guns	34	453	1,283	529
Aeroplanes.	121	352	454	359
Tanks	—	—	8	8
Vehicles, etc.	503	2,029	2,414	2,152
Totals	658	2,834	4,159	3,048
Stores—	Tons.	Tons.	Tons.	Tons.
Supplies, etc.	12,310	38,908	128,917	763,924*
Empties	8,348	72,842	114,088	
Totals	20,658	111,750	243,005	763,924

* Included as empties (Stores).

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THE ROYAL NAVAL AIR SERVICE IN THE WAR.

THE following is an extract from the Parliamentary Paper [Cmd. 100] entitled "Synopsis of British Air Effort during the war":—

EARLY ORGANISATION.

On August 5, 1914, the British Air Service consisted of a Naval Wing known as the R.N.A.S., a Military Wing, known as the R.F.C., and a Central Flying School. The Naval Wing, which was controlled by the Admiralty, comprised an airship squadron, recently taken over from the Military Wing, and three aeroplane and seaplane squadrons, with a total of ninety-three machines. The Military Wing, which was controlled by the War Office, comprised four aeroplane squadrons with a total of 179 machines. The two wings had a total combined *personnel* of 197 officers and 1647 other ranks. The squadron was the tactical unit and still remains so.

The Royal Aircraft Factory at Farnborough was mainly engaged on experimental work, and the bulk of the machines and equipment for the Air Service was supplied by private manufacturing firms.

On the declaration of war some additional squadrons were hastily formed by the R.N.A.S. from all available resources in the country, and certain cross-Channel and other vessels were chartered and converted into aircraft carriers. Two squadrons of aeroplanes, manned by the R.N.A.S., were sent to Belgium with the Naval Division to attempt to defend Antwerp, and the aircraft flown from the carriers undertook the protection of the ship channels off the East Coast of England from minelaying, and made attacks on the German Frisian Coast.

The squadrons with the Naval Division constituted the nucleus of the force which was later formed at Dunkirk, under naval control, for the attack of the bases at Zeebrugge and Ostend. The employment of the small aircraft carriers originated the practice, since largely developed, of carrying aircraft in men-of-war, in lighters, and in special large aircraft-carrying ships attached to the Fleet.

* * * *

DARDANELLES.

The Air Force in the Gallipoli campaign was supplied entirely by the R.N.A.S. In spite of many and severe hardships, and almost insuperable difficulties in regard to transport, supply, and workshop and repair arrangements, much excellent work was accomplished, particularly during the latter stages of operations. In addition to the normal duties of co-operating with the Army and the various units of the Fleet, the R.N.A.S. was called upon to photograph the greater portion of the Peninsula for map-making purposes, and by means of these photographs the first very inaccurate maps were corrected.

Constant bombing operations were also carried out on various objectives on the Peninsula and in the Straits, and frequent raids were made on the enemy's lines of communication, on the mainland, and upon Constantinople itself.

The Dardanelles campaign was essentially a joint enterprise, and the fact that the R.N.A.S. was able to supply the needs of both Navy and Army is a tribute to its efficiency and adaptability. A single intelligence system was maintained, and the photographs and observations were distributed to both the Naval and Military Staffs. Further, it is not too much to claim that the success of the evacuations from Suvla and Helles were, in a considerable measure, due to the reconnaissance and patrol work of the R.N.A.S. It was in this campaign that torpedoes were for the first time carried by aircraft, and three enemy ships were destroyed in the Dardanelles by this means.

* * * *

PALESTINE.

The Palestine Brigade was formed in 1917 by expanding the wing attached to the E.E.F. This in turn had developed from the nucleus of one flight which was formed to co-operate with our troops in the defence of the Suez Canal early in 1915. The Air Force in this theatre has had an exceptionally splendid record, which culminated in the Palestine Brigade achieving complete air supremacy during the critical period of the final operations. No single hostile aeroplane crossed our line. It is worthy of note that such complete air supremacy has not been obtained elsewhere by any belligerent in any theatre of war.

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East Africa.

Operations in East Africa were commenced by the R.N.A.S. sending out some seaplanes to operate on the coast late in 1914. Their early work is described later under the heading of "Co-operation with the Navy." In 1915 this force was brought up to a strength of two squadrons, the seaplanes being replaced by aeroplanes, and was placed under the orders of the military forces operating in the north. Most valuable reconnaissance work over dense bush country was carried out under difficult conditions. Every landing ground had to be constructed by making clearings in the bush, and at one time the lines of communication were over 600 miles in length. Shortly afterwards additional squadrons were sent out by the R.F.C. to operate further south and also did valuable work.

Grand Fleet.

In November, 1914, the R.N.A.S. supplied aircraft to the Fleet for reconnaissance purposes and defence against zeppelins, and by the spring of 1915 a Transatlantic liner and two smaller vessels had been provided equipped with reconnaissance and fighter seaplanes. These were subsequently replaced by aeroplanes which were flown from the decks and turrets of ships while the latter were under way.

The potential value of aerial scouts was soon realised, with the result that several other large aircraft-carrying ships were added to the Fleet, and the practice was in process of being established by which each battleship, battle-cruiser, and light cruiser was to carry its own aircraft on proceeding to sea.

By July, 1918, seventy aeroplanes were being carried by the Fleet as part of the battle equipment.

Few opportunities presented themselves for employment of these aircraft in the face of the enemy, but the arrangements for their employment prior to and during a Fleet action were systematically improved. Very valuable work was done during the battle of Jutland, in several raids into the Heligoland Bight, and in attacks on German airships met in the North Sea.

Anti-Submarine Patrols.

The patrol of waters infested by enemy submarines was commenced by the R.N.A.S. in September, 1914, and was gradually increased in scope until, at the time of the declaration of the Armistice, there were no fewer than thirty-nine seaplane and twenty-six aeroplane stations round the British coast and in the Mediterranean engaged on this duty.

The duties of the aircraft engaged consisted of carrying out patrols over the seas in search of enemy submarines, in escorting convoys, and in assisting surface vessels to hunt submarines known to be in their vicinity. It may be claimed that the success which has attended the anti-submarine campaign has been largely due to their activities.

Dover-Dunkirk Patrol.

As before mentioned, the R.N.A.S. squadrons which proceeded to the Dunkirk district were engaged against the enemy very early in the war. Their numbers were gradually increased to eight fighters and bombers, and during the following four years an unremitting attack by air on the submarine bases at Zeebrugge, Ostend, etc., was carried out in spite of strong anti-aircraft defences.

The Dover-Dunkirk group also constantly assisted in denying the Dover Straits to enemy submarines, in attacking enemy aeroplanes proceeding to or returning from London, and in spotting for the British monitors, etc., bombarding the enemy bases and forts.

Harwich and the Nore.

In addition to anti-submarine operations, the aircraft under naval orders in the locality of Harwich and the Nore have been continuously engaged in locating and destroying mines laid by the enemy off our coasts. Special long-distance reconnaissance work was also carried out from this area, and flights were made into localities infested with enemy seaplanes, and often resulted in heavy engagements, necessitating as many as five machine-guns being carried in the large seaplanes.

Mediterranean and Adriatic.

In view of the great activities of enemy submarines in the Mediterranean and Adriatic Seas, the work of the aircraft engaged on anti-submarine duties has been of a most important character.

Anti-submarine aircraft have been stationed in the Ægean and at Malta, Gibraltar, and latterly at Alexandria. In the early part of 1917 a wing was also

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formed in Italy to assist the Otranto barrage in closing the southern end of the Adriatic to enemy submarines, and in bombing the Austrian naval ports in the Adriatic. These units have also assisted materially in protecting convoys and in harassing submarines in all parts of the Mediterranean.

Other functions have been the bombing of lines of communication and places of military importance in Turkey and Albania, and the defence of Allied territory from enemy aerial attack.

Dardanelles, Palestine, and the Red Sea.

The operations of the R.N.A.S. in the Dardanelles and Palestine have already been referred to.

East and Central Africa.

As already stated, seaplanes were sent to the East Coast of Africa early in 1915 to take part in the operations on the Rufigi river, the approaches to which had been fortified by the crew of the German cruiser Königsberg, and rendered valuable assistance in locating the position of the cruiser and of the gun emplacements, and in directing the fire of our ships over the bush.

Several aircraft at a later date were sent to Lake Tanganyika to co-operate with the Belgian forces.

Archangel.

In 1918 the aircraft carrier H.M.S. Nairana was sent to assist the Navy in the attack on this port. The seaplanes did valuable reconnaissance and bombing work, and materially assisted the capture of the port.

Airship Service.

On the outbreak of war this service consisted of three airships only, with *personnel* of twenty-four officers and 174 other ranks; there are now (November, 1918) 103 ships in service, with a *personnel* of 580 officers and 6534 other ranks.

During the transportation of the original Expeditionary Force to France in 1914, two of the three existing airships assisted in patrolling the Channel. These were subsequently employed on similar patrol duties from Kingsnorth and Barrow. The third airship was based at Dunkirk in the early part of 1915, and co-operated with the Belgian artillery at Ostend. The development of our present airship service, however, may be said to date from February, 1915, when approval was given for the construction of the first S.S. airship. During the year, twenty-seven ships of this type were completed, the construction of a further twenty was begun, and the new "Coastal" type was also developed. In the meantime, experiments were directed to extending the range and duration of patrols, and a number of other new types were produced and commissioned.

In August, 1915, an airship contingent was dispatched to the Dardanelles, and was incorporated in the force already referred to. Its head-quarters were at first at Imbros, but were subsequently transferred to Mudros. Early in 1916 an outlying station was formed at Kassandra for anti-submarine work. Towards the end of 1916 one airship was stationed at Dunkirk, and another was lent to the R.F.C. for work in France. In 1917 a detachment was sent to Italy in connection with six airships purchased by the Italian Government.

The duties carried out by the airship service are reconnaissance, coastal, and anti-submarine patrols, escorts, and mine detecting.

Kite Balloons.

Four units of this branch were sent to France to operate with the Army, and one unit was sent out to the Dardanelles in H.M.S. Manica, a merchant vessel chartered and fitted out for the purpose.

The work of these units was so successful that additional sections were rapidly formed. The R.F.C. took over the balloon work on the Western front, and five other vessels were equipped for balloon service in East Africa, in the Mediterranean, and off the Belgian coast.

At the end of 1915, a great advance in the development of balloons was made by the introduction of the practice of towing them from ships under way. The invention of the French Cuaquot balloon in 1916 assisted in the development, and the employment of balloons towed from all types of ships, from submarines to battle-cruisers, for reconnaissance and artillery spotting purposes was soon a prevalent practice.

By July, 1918, no fewer than thirty balloons were being taken to sea by the Grand Fleet on all occasions.

Balloons have aided materially in the anti-submarine campaign, and have been towed from drifters, trawlers, and motor-launches in large numbers for reconnaissance purposes when hunting submarines and also when escorting convoys.

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NAVAL TERMS OF THE ARMISTICE AND TREATY OF PEACE.

THE following were the terms, so far as they related to the Naval conditions, of the Armistice concluded with Turkey, signed October 30, 1918, which came into force October 31, 1918.

Opening of the Dardanelles and Bosporus and secure access to the Black Sea. Allied occupation of the Dardanelles and Bosporus forts.

Positions of all minefields, torpedo-tubes, and other obstructions in Turkish waters to be indicated, and assistance given to sweep or remove them as may be required.

All available information as to mines in the Black Sea to be communicated.

Surrender of all war vessels in Turkish waters, or in waters occupied by Turkey. These ships to be interned at such Turkish port or ports as may be directed, except such small vessels as are required for police or similar purposes in Turkish territorial waters.

Free use by Allied ships of all ports and anchorages now in Turkish occupation, and denial of their use by enemy. Similar conditions to apply to Turkish mercantile shipping in Turkish waters for purposes of trade and demobilisation of the Army.

Use of all ship-repair facilities at all Turkish ports and arsenals.

Wireless telegraph and cable stations to be controlled by the Allies, Turkish Government messages excepted.

Prohibition to destroy any naval, military, or commercial material.

Facilities to be given for the purchase of coal, oil-fuel, and naval material from Turkish sources after the requirements of the country have been met. None of the above material to be exported.

Surrender of all ports occupied in Tripolitania and Cyrenaica, including Misurata, to the nearest Allied garrison.

All Germans and Austrians, naval, military, and civilian, to be evacuated within one month from Turkish dominions. Those in remote districts as soon after as may be possible.

AUSTRIA-HUNGARY.

Naval conditions of the Armistice signed November 3, 1918, which came into force on the next day.

Immediate cessation of all hostilities at sea, and definite information to be given as to the location and movements of all Austro-Hungarian ships. Notification to be made to neutrals that freedom of navigation in all territorial waters is given to the Naval and Mercantile Marines of the Allied and Associated Powers, all questions of neutrality being waived.

Surrender to the Allies and United States of America of fifteen Austro-Hungarian submarines, completed between the years 1910 and 1918, and of all German submarines which are in or may hereafter enter Austro-Hungarian territorial waters. All other Austro-Hungarian submarines to be paid off and completely disarmed, and to remain under the supervision of the Allies and United States of America.

Surrender to the Allies and United States of America, with their complete armament and equipment, of three battleships, three light cruisers, nine destroyers, twelve torpedo boats, one mine-layer, six Danube monitors, to be designated by the Allies and the United States of America. All other surface warships (including river craft) are to be concentrated in Austro-Hungarian naval bases to be designated by the Allies and the United States of America, and are to be paid off and completely disarmed and placed under the supervision of the Allies and the United States of America.

Freedom of navigation to all warships and merchant ships of the Allied and Associated Powers to be given in the Adriatic and up the river Danube and its tributaries in the territorial waters and territory of Austria Hungary. The Allies and Associated Powers shall have the right to sweep up all minefields and obstructions, and the positions of these are to be indicated. In order to ensure the freedom

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of navigation on the Danube, the Allies and the United States of America shall be empowered to occupy or to dismantle all fortifications or defence works.

The existing blockade conditions set up by the Allied and Associated Powers are to remain unchanged, and all Austro-Hungarian merchant ships found at sea are to remain liable to capture, save exceptions which may be made by a Commission nominated by the Allies and United States of America.

All naval aircraft are to be concentrated and immobilised in Austro-Hungarian bases to be designated by the Allies and United States of America.

Evacuation of all the Italian coasts and of all ports occupied by Austria-Hungary outside their national territory, and the abandonment of all floating craft, naval materials, equipment, and materials for inland navigation of all kinds.

Occupation by the Allies and the United States of America of the land and sea fortifications and the islands which form the defences and of the dockyards and arsenal at Pola.

All merchant vessels held by Austria-Hungary belonging to the Allies and Associated Powers to be returned.

No destruction of ships or of materials to be permitted before evacuation, surrender, or restoration.

All Naval and Mercantile Marine prisoners of war of the Allied and Associated Powers in Austro-Hungarian hands to be returned without reciprocity.

GERMANY.

Naval conditions of the Armistice concluded November 11, 1918.

Immediate cessation of all hostilities at sea, and definite information to be given as to the position and movements of all German ships.

Notification to be given to neutrals that freedom of navigation in all territorial waters is given to the Navies and Mercantile Marines of the Allied and Associated Powers, all questions of neutrality being waived.

All Naval and Mercantile Marine prisoners of war of the Allied and Associated Powers in German hands to be returned, without reciprocity.

To surrender at the ports specified by the Allies and the United States all submarines at present in existence (including all submarine cruisers and mine-layers), with armament and equipment complete. Those that cannot put to sea shall be deprived of armament and equipment, and shall remain under the supervision of the Allies and the United States. Submarines ready to put to sea shall be prepared to leave German ports immediately on receipt of wireless order to sail to the port of surrender, the remainder to follow as early as possible. The conditions of this Article shall be completed within fourteen days of the signing of the armistice.

The following German surface warships, which shall be designated by the Allies and the United States of America, shall forthwith be disarmed and thereafter interned in neutral ports, or, failing them, Allied ports, to be designated by the Allies and the United States of America, and placed under the surveillance of the Allies and the United States of America, only care and maintenance parties being left on board, namely:—

6 battle-cruisers.
10 battleships.
8 light cruisers, including two mine-layers.
50 destroyers of the most modern type.

All other surface warships (including river craft) are to be concentrated in German naval bases, to be designated by the Allies and the United States of America, completely disarmed and placed under the supervision of the Allies and the United States of America. All vessels of the Auxiliary Fleet are to be disarmed. All vessels specified for internment shall be ready to leave German ports seven days after the signing of the Armistice. Directions for the voyage shall be given by wireless.

Note.—A declaration has been signed by the Allied delegates and handed to the German delegates to the effect that, in the event of ships not being handed over owing to the mutinous state of the Fleet, the Allies reserve the right to occupy Heligoland as an advanced base to enable them to enforce the terms of the Armistice. The German delegates have on their part signed a declaration that they will recommend the Chancellor to accept this.

The Allies and the United States of America shall have the right to sweep up all minefields and destroy all obstructions laid by Germany outside German territorial waters, and the positions of these are to be indicated.

Freedom of access to and from the Baltic to be given to the Navies and Mercantile Marines of the Allied and Associated Powers. This is to be secured by the occupation of all German forts, fortifications, batteries, and defence works of all kinds in all

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the routes from the Cattegat into the Baltic, and by the sweeping up and destruction of all mines and obstructions within and without German territorial waters without any questions of neutrality being raised, and the positions of all such mines and obstructions are to be indicated by the Germans.

The existing blockade conditions set up by the Allied and Associated Powers are to remain unchanged, and all German merchant ships found at sea are to remain liable to capture. The Allies and United States contemplate the provisioning of Germany during the Armistice as shall be found necessary.

All aerial forces are to be concentrated and immobilised in German bases to be specified by the Allies and the United States of America.

In evacuating the Belgian coasts and ports, Germany shall abandon, *in situ* and intact, the port material and material for inland waterways, also all merchant ships, tugs, and lighters, all naval aircraft, and air materials and stores, all arms and armaments and all stores and apparatus of all kinds.

All Black Sea ports are to be evacuated by Germans; all Russian warships of all descriptions seized by Germany in the Black Sea are to be handed over to the Allies and the United States of America; all neutral merchant ships seized in the Black Sea are to be released; all warlike and other material of all kinds seized in those ports are to be returned, and German materials as specified in Clause 28 are to be abandoned.

All merchant ships at present in German hands belonging to the Allied and Associated Powers are to be restored to ports to be specified by the Allies and the United States of America without reciprocity.

No destruction of ships or of materials to be permitted before evacuation, surrender, or restoration.

The German Government shall formally notify the neutral Governments, and particularly the Governments of Norway, Sweden, Denmark, and Holland, that all restrictions placed on the trading of their vessels with the Allied and Associated countries, whether by the German Government or by private German interests, and whether in return for special concessions, such as the export of shipbuilding materials or not, are immediately cancelled.

No transfers of German merchant shipping of any description to any neutral flag are to take place after the signature of the Armistice.

The following were the principal occurrences relating to the German naval surrender. On November 13th the light cruiser Königsberg put to sea, having on board the plenipotentiaries of the Workmen's and Soldiers' Council of the German Fleet, in order to meet the representatives of the British Admiralty.

On the afternoon of November 15th the German Rear-Admiral Hugo von Meurer, with four officers of his staff, met Admiral Sir David Beatty on board the Queen Elizabeth. They were brought from the Königsberg by the British destroyer Oak. The meeting between Sir David Beatty and Admiral von Meurer took place in the Commander-in-Chief's cabin. The British Admiral refused to meet the Workmen's and Soldiers' delegates. The conference lasted until the early hours of November 16th. It was resumed before midday, and lasted until about 6 o'clock.

Having been reviewed by King George at Rosyth on the previous day, the Grand Fleet left its anchorage in the Forth at daybreak on November 21st, and at 8.30 a.m. the German ships were sighted. The divisions of British, French, and American warships received the surrender of the enemy ships and brought them to the harbour.

Seventy ships of the German Navy—five battle-cruisers, nine battleships, seven light cruisers, and forty-nine destroyers surrendered on November 21st at Rosyth. One battleship, one battle-cruiser,

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one light cruiser were short of the numbers named in the Armistice terms. The number of capital ships surrendered was brought up to sixteen by the inclusion of eleven battleships and five battle-cruisers (see pp. 304–5). The chart showing the disposition of the ships at the surrender will be found facing p. 44. On the 22nd the enemy ships set out under a strong escort for Scapa Flow, where they were to remain until the Peace Treaty decided their fate.

At 11 a.m. on the 21st Admiral Beatty made a signal by wireless to the German Admiral:—"The German flag will be hauled down at sunset to-day (Thursday), and will not be hoisted again without permission." This order was complied with by the Germans, but on the following day Rear-Admiral von Reuter from the Friedrich der Grosse issued a protest to Admiral Beatty:—

You ordered by wireless of November 21st that the German flag, after being hauled down at sunset, was not to be hoisted again without special permission. On November 21st I urgently requested the Chief of the Staff of Admiral Madden that this order should be cancelled, as the German ships have flown their flags honourably. I have not yet received an answer.

According to the terms of the Armistice, the ships were to be interned in neutral harbours or in harbours of the Allies. As far as I know, during internment in neutral harbours during this war and former wars flags have always remained hoisted. Had I been interned in a neutral harbour this would have been the case. Neutral harbours and harbours of the Allies are absolutely parallel, according to the literal conditions of the Armistice and to the sense of the conditions of internment.

Therefore, I esteem it unjustifiable and contradictory to international custom to order the striking of the war flag in the German ships. In addition, I am of opinion that the order to strike the flag is not in keeping with the idea of chivalry between honourable opponents. I therefore now enter an emphatic protest against this order.

The Commander-in-Chief of the Grand Fleet made the following reply:—

Your protest against my order regarding the flying of German colours is noted. I would draw your attention to the fact that an armistice suspends hostilities and that a state of war still exists between Germany and the Allies. Under the circumstances no enemy vessel can be permitted to fly the national ensign in British ports while under custody.

With regard to the treatment of the crews of the surrendered ships, the following Memorandum was issued by the Commander-in-Chief, Grand Fleet:—

1. It is to be impressed on all officers and men that a state of war exists during the Armistice.
2. Their relations with officers and men of the German Navy with whom they may now be brought into contact are to be of a strictly formal character.
3. In dealing with the late enemy, while courtesy is obligatory, the methods with which they have waged the war must not be forgotten.
4. No international compliments are to be paid and all conversation is forbidden, except in regard to the immediate business to be transacted.
5. If it is necessary to provide food for German officers and men they should not be entertained, but it should be served to them in a place specially set apart. If it is necessary to accept food from the Germans a request is to be made that it is to be similarly served.

On November 25th the following message was published:—

"The Board of Admiralty desire to express to the officers and men of the Royal Navy and Royal Marines, on the completion of their great work, their congratulations

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on a triumph to which history knows no parallel. The surrender of the German Fleet, accomplished without shock of battle, will remain for all time the example of the wonderful silence and sureness with which sea-power attains its ends. The world recognizes that this consummation is due to the steadfastness with which the Navy has maintained its pressure on the enemy through more than four years of war, a pressure exerted no less insistently during the long monotony of waiting than in the rare opportunities of attack."

Surrender of Enemy Submarines.

On November 20th twenty German submarines came to surrender to the British squadrons and flotillas under the command of Rear-Admiral Sir Reginald Tyrwhitt off the Suffolk coast. The submarines were accompanied by two German transports, the Tibania and Sierra Ventana, which were to take the submarine crews back to Germany. All the crews of the British ships were at their quarters, and with the U-boats in charge proceeded towards Harwich. About 20 miles off the port the ships anchored and British crews were put on board the German vessels to take them into harbour. As the boats went through the gates the White Ensign was hoisted over each German flag. On November 21st nineteen of the submarines, one having broken down on the way, surrendered to the British naval forces. On November 22nd twenty more submarines were surrendered, and on November 25th a further twenty-eight U-boats arrived.

After the surrender of the twenty-eight U-boats on November 24th, the First Lord of the Admiralty addressed the following message to the Chief of the Harwich Submarine Depôt :—

The surrender of the enemy submarines which has been carried out so successfully for the last few days marks the culmination of the magnificent work performed during the four and a half years of war by the submarine services of the Royal Navy. I wish to convey to you and through you to all ranks and ratings under your command my most sincere congratulations on the splendid results which have been achieved by their constant watchfulness, skill, and bravery, and the exemplary standard which they have set in the legitimate warfare.—Eric Geddes.

On November 26th the following telegram from Rear-Admiral ir Reginald Tyrwhitt to Captain Addison, R.N., in charge of the submarines at Harwich, who directed the operations of the surrender:—

I wish to congratulate you and your officers on the exceedingly well-organised and smart manner in which the taking over of the German submarines has been conducted. I particularly admired the fine handling of the submarines in the harbour. It impressed the Huns as much as it did me.

On November 27th a further twenty-seven U-boats were given up to the Harwich naval forces, and eight more on December 1st. The following is the official list of the U-boats which were moored off Parkeston Quay at Harwich on November 27th. Up to the end of the year the only additions to this list were the eight submarines given up on December 1st.

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U-boats.—9, 19, 24, 30, 35, 43, 46, 52, 54, 55, 57, 60, 67, 70, 79, 86, 90, 91, 94, 96, 98, 100, 101, 105, 107, 108, 111, 112, 113, 114, 117, 118, 119, 120, 121, 123, 125, 126, 135, 139, 141, 160, 161, 162, 163, 164.

One U A-boat.

U B-boats.—21, 24, 25, 27, 28, 34, 60, 62, 64, 67, 73, 79, 80, 84, 86, 87, 88, 91, 92, 93, 94, 95, 96, 97, 98, 100, 101, 102, 106, 111, 112, 114, 118, 120, 121, 122, 125, 126, 131, 132, 142, 149, 150.

U C-boats.—17, 31, 45, 58, 89, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105.

Converted Mercantile Cruisers.—151, 152, 153, 155.

The following were the Naval terms of the Treaty of Peace presented to the German plenipotentaries, which were officially summarised in a statement published May 8:

Within two months the German naval forces in commission must not exceed six battleships of the Deutschland or Lothringen type, six light cruisers, twelve destroyers, and twelve torpedo boats, or an equal number of ships constructed to replace them. No submarines are to be included, and all other warships are to be placed in reserve or devoted to commercial purposes. Germany may keep in commission a fixed number of mine-sweeping vessels until the mines within certain specified areas in the North Sea and Baltic have been swept up. After the expiration of two months the total exclusive *personnel* of the Navy must not exceed 15,000, including a maximum of 1500 officers and warrant officers. All German surface warships interned in Allied or neutral ports are to be finally surrendered. Within two months certain additional warships enumerated in the Treaty and now in German ports will be surrendered at Allied ports. The German Government must undertake the breaking up of all German warships under construction. Auxiliary cruisers, etc., are to be disarmed and treated as merchant ships. Within one month all German submarines, salvage vessels, and docks for submarines capable of proceeding under their own power or of being towed must have been handed over at Allied ports.

The remainder and those under construction must be broken up by Germany within three months.

Material arising from the breaking up of German warships may not be used except for industrial purposes, and may not be sold to foreign countries. Except under specified conditions for replacement, Germany is forbidden to construct or acquire any warships, and the construction or acquisition of any submarines whatever is prohibited. Vessels of war are only to have a fixed allowance of arms, munitions and war material. All excess of arms, munitions, and war material is to be surrendered, and no stocks or reserves are allowed.

The *personnel* of the German navy must be recruited entirely by voluntary engagements for a minimum period of twenty-five consecutive years for officers and warrant officers, and twelve consecutive years for petty officers and men, under various restrictions.

In order to ensure free passage into the Baltic, Germany is not to erect any fortifications in certain specified areas, nor to instal any guns commanding maritime routes between the North Sea and the Baltic. Existing fortifications within those areas are to be demolished and guns removed. Other fortified works within 50 kilometres of the German coast or on German islands are to remain, as being of a defensive nature, but no new fortifications may be constructed and the armaments may not be increased. The maximum stocks of ammunition allowed for such defences are 1500 rounds per piece for 4 1-in. guns and under, and 500 rounds per piece for guns exceeding that calibre.

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THE UNITED STATES NAVY.

THE Annual Report of the Secretary of the Navy for the financial year ending June 30, 1918, was dated December 1st, and was mainly concerned with the developments and operations of the American Navy during the war. It included the Estimates for the year 1919–1920, which the Secretary said amounted to by far the largest sum the Congress had been requested to appropriate for the Navy in a single measure. The total sum was $2,644,307,046, but it was generally believed that very large reductions would be effected.

On December 30th Mr. Daniels appeared before the House Committee on Naval Affairs, and presented revised Estimates, with a draft of a Bill to carry out the three years' programme. The following account is summarised from the *Army and Navy Journal* of New York :—

THE REVISED ESTIMATES.

The original Estimates for 1920 were prepared before the Armistice was signed The revised Estimates called for $975,903,621·28, an indication of the proportions in the reductions being furnished by this partial table :

	Original.	Revised.
Pay, Miscellaneous	$10,000,000	$4,500,000
Aviation	225,000,000	36,000,000
New Batteries	115,000,000	.. ..
Ammunition	125,000,000	.. ..
Yards and Docks	12,500,000	7,500,000
Emergency Yards and Docks	5,000,000	.. ..
Naval Training Camp	10,000,000	.. ..
Navy Pay	570,046,071	211,602,395
Naval Construction	200,000,000	55,000,000
Improving Yards	5,000,000	.. ..
Provisions	202,343,665	57,790,213
Naval Emergency Fund	175,000,000	61,855,000

For the next financial year Mr. Daniels asked for an appropriation of $55,000,000. for the new building programme. In his formal statement he said :

"No step backward, but a long step forward, should be taken by this Congress in strengthening the American Navy. The additional three-year programme recommended in my annual report is a conservative one intended to contain the policy of steady upbuilding of the Navy established in 1916. The General Board of the Navy, after extensive investigation and exhaustive consideration, has recommended a much larger programme extending to the year 1925. While their recommendations are entitled to, and have received, very careful consideration, the Department has not felt justified at this time in recommending such an extensive programme or one extending over such a long period. At the same time a year-by-year programme is not thought to be advisable; it is too much of the hand-to-mouth nature, and naval experts and thinking men interested in the Navy have seen its unwisdom and in 1916 succeeded in substituting a better plan.

"As regards the larger vessels of definite types, the numbers of each type can now be fixed and have been recommended. I am asking that authorisation be given for the construction of ten Dreadnoughts, six battle-cruisers and ten scout-cruisers, to be laid down during the coming three years, and 130 other ships of such type and character as may give us a well-rounded Navy. The initial appropriation need not be large, for work on some of the big ships already authorised was necessarily deferred during the war in order that work might be concentrated upon destroyers and like small craft and merchant ships. Now the construction of the big ships will be pushed as rapidly as possible, the number of small craft being ample until more

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Dreadnoughts and other big ships are added to the naval force. As regards these smaller vessels, a general authorisation is requested in order that a study of all types produced by all nations during the war may be made and preliminary work may be done. In view of the large number of smaller vessels undertaken during the war which will continue to be constructed during the next year, it is not recommended that the construction of additional smaller vessels be pressed at this time.

1916 Programme.

"The details concerning them can be taken up subsequently. In this connection it should be pointed out that, although the programme of 1916 extended over three years, the individual vessels to be undertaken in any specific year were specified each year by the Congress. It is expected and recommended that this practice be continued. My thought is, and it finds expression in the Estimates, that, under present conditions, we ought to make no change in the naval programme which the United States set for itself in 1916. We ought neither to commit ourselves to any gigantic expansion nor to recede from the wise three-year policy.

"It is our duty to consider the obligations imposed upon America if the Peace Conference now occupied at Versailles upon the greatest task which ever engaged the attention of a human gathering during the whole course of the world's history completes its work constructively and satisfactorily, as we all hope it will do. Let us assume that this conference will give birth to some plan looking forward to a concert of the nations for the maintenance of peace, whether it be a League of Nations, according to the present acceptance of the meaning of that term, or what not. It will be some manner of body to which differing nations will perforce submit their differences for adjudication, and which will be sufficiently powerful to induce acceptance of its decisions when once they shall be made. The experiences of poor and imperfect humanity has very fully taught the lesson that power for the enforcement of judicial decisions sometimes needs to be considerable; and back of that must lie a tremendous peace power of prevention, if judicial decisions are to be made as infrequent as possible, indeed if society is to exist at all. Arbitration which had behind it no power of compelling the disputants to accept the decisions of the arbitrators would have no value whatsoever in cases of serious emergency.

America and World Police.

I am quite certain that it would be improper for America even to consider the proposition of contributing to the world police a number of units smaller than that contributed by the greatest other Power. It seems to me that this is obviously the American duty and that the other nations of the world would be justified in regarding us as shirkers if we failed to accept the burden of it cheerfully and turn to the performance of it with an unexampled earnestness and high efficiency. It would be contrary to all our traditions and all our ideals to assume that in the planning of a new and mighty Navy America could be animated either by fear or by the intention of aggression. America is committed to the promise of entering into a general and genuine plan for the reduction of armaments. If the outcome of the Peace Conference shall be that all nations will concur in this ideal, then the United States will gladly join them in the worthy plan. For three years we have been committed to such a programme in such circumstances. But if such an agreement cannot be shortly arranged, then we here in America must accept the burden which the failure automatically will thrust upon us and meet it by adding such units to our Navy as will secure our own safety and aid powerfully in protecting the peace of the world.

"Every year since I have been Secretary of the Navy I have urged an international agreement to end competitive and costly naval construction. The day for the realisation of that long-cherished idea seems not far distant. We are pledged to co-operate with other nations to a reduction of armament. Unless the nations now agree upon such conventions as will compel the settlement of national differences by arbitration, we will fail to garner the best fruits of the dearly-bought victory. For one, I believe the war has taught us two things. First, that national differences and greed for power may always endanger the peace of the world; second, that to prevent differences and selfish ambitions from producing another war there must be constituted a high tribunal and there must be a world-police power so strong that no nation will dare to defy the strength of a decree of such an international tribunal."

World Tribunal might end Programme.

When he had finished reading this statement Mr. Daniels submitted to the Committee a draft of a Bill to carry out the new three-year building programme. This calls for ten first-class battleships, to cost, exclusive of armour and armament, $21,500,000 each; six battle-cruisers to cost, exclusive of armour and armament

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$23,500,000 each; ten scout-cruisers to cost $7,350,000 each, and 130 small craft, the character and cost to be determined later. Mr. Daniels proposed that the Bill should contain the following provision:—

"If at any time before the construction authorised by this Act shall have been contracted for there shall have been established with the co-operation of the United States of America an international tribunal or tribunals, competent to secure peaceful determination of all international disputes, and which shall render unnecessary the maintenance of competitive armaments, then, and in that case, such naval expansions may be inconsistent with the engagements made in the establishment of such tribunal or tribunals may be suspended, when so ordered by the President of the United States."

As to the construction of smaller craft the Secretary said the Department would like to have the authority to build some small craft, but would not be able to do this satisfactorily until the officers in charge of construction had opportunity "to study at first hand the value of small craft in the naval warfare abroad." There were 470 destroyers, building or built, and all of the small craft could be finished by the end of June, 1920.

The Navy and the League of Nations.

Several members of the Committee asked questions. Mr. Butler asked "How will you settle how large our Navy shall be if a League of Nations is formed?" To which Mr. Daniels replied: "We ought to contribute in units, power and men just as much as any other nation and not allow any other nation to have more power than we have." Mr. Venable enquired if any definite plan had been agreed upon for putting force behind the judgments of the proposed League of Nations and just what the "jurisdiction of the court would be." Secretary Daniels made no definite answer to this. Representative Kelly asked, "Do we need the most powerful Navy in the world?" To which Secretary Daniels replied, "Absolutely." Mr. Kelley then enquired, "When did you come to that conclusion?" To which Mr. Daniels replied that until the outbreak of the war he had believed that the capitalists and the labouring people would be strong enough, even in Germany, to overcome the influence of the militarists. When he found that he was wrong he said, "I then saw the necessity of having the biggest Navy in the world for the United States." He continued, "Looking back, I now see that it was a mistake to have even the second best Navy in the world. I now think it is an indefensible thought to have any Navy but the most powerful, if the Peace Conference fails to limit armaments.* . . . If there is no agreement, then we must build the ships so as to have such a powerful Navy that it would make any nation in the world think several times before venturing to attack us." "Does the President back the policy to make us the first Naval Power in the world?" asked Representative Kelley, of Michigan. "Yes; if competitive building is to continue," said the Secretary. "We are now easily the second Naval Power, but this three-year programme will not make us the first. You cannot do anything that would so strengthen the country's position in the Peace Conference as to authorise this large Navy. The President very earnestly urges that this programme be adopted. Nothing would so aid him in the Peace Conference as the authorisation by Congress of a big Navy."

Personnel.

As to enlistment, 250,000 men would be required, of which number 60,000 would be assigned to the merchant vessels. By action of the Shipping Board on December 13th the Navy hereafter will be required to man only troopships to be commissioned and those now in the Service. All cargo and steamships to be commissioned hereafter will be manned by civilian crews, which might be obtained from the Naval Reserves now being demobilised. The Secretary read a letter from the Shipping Board showing that the requirements of the Board for the next year would be 36,000 men, or 3000 a month.

The permanent strength of the Navy to-day is as follows;—Enlisted men, 131,485; apprentice seamen, 6000; Flying Corps, 350; Hospital Corps, 5720; making a total of 143,555. The temporary strength of the Navy to-day, which will be reduced to

* With reference to the declaration given in the above text, the following later statement made by Mr. Daniels regarding his opinion upon American Naval Policy and the object of his visit to Europe should be noticed:—"If international reduction of armaments were not assured by the Peace Conference America would build a Navy equal to that of any other Power." Mr. Daniels corrected the very prevalent impression that America wanted to deprive Great Britain of the naval pre-eminence which she considers vital to the Empire's safety. He said that the United States fully realised the necessity of this pre-eminence to an Empire such as ours.

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the above strength six months after the signing of the Treaty of Peace, is as follows: Enlisted men, 181,485; apprentice seamen, 24,000; trade schools, 14,000; Flying Corps, 10,000; Hospital Corps, 14,718; a total of 244,203.

The proposed legislation does not change the temporary plans in any way except to prescribe that the Flying Corps shall not exceed 2000 men instead of 10,000, as now provided by law, but it does increase the total number of men in the Navy to 250,000, including the Hospital Corps, by employing enough men of the Naval Reserve Force to make the total strength equal to 250,000, which is deemed necessary not only to operate the ships of the Navy but to provide men enough for the operation of ships under the Shipping Board. The operation of the proposed legislation terminates June 30, 1920.

Ship Construction under Way.

The Secretary asked for $55,000,000 for ship construction this year. It is intended to keep in commission all the new battleships, from the South Carolina up, and the destroyers, especially the newer ones.

All of the thirteen battleships now under construction are building under regular Navy Appropriation Acts. The last ten were authorised under the three-year building programme of August 29, 1916. During the war the work was practically suspended upon the battleships of the three-year programme except the Maryland and the West Virginia. The Mississippi and the New Mexico were completed during the war; work continued on the Idaho, the Tennessee and the California. All battleship work will now proceed as fast as material and labour become available.

Work on the six battle-cruisers authorised by the programme of 1916 was suspended during the war. Improved plans are now in the hands of the contractors and work will proceed. They have been assigned as follows: Lexington, Fore River Shipbuilding Co.; Constellation and Ranger, Newport News Shipbuilding and Dry-dock Co.; Saratoga, New York Shipbuilding Co.; Constitution and another not named, Philadelphia Navy Yard. On the ten scout-cruisers of the programme of 1916 work was practically suspended during the war. Work upon all will now go ahead.

Ships' Complements.

On the question of how many men could be placed on board ships there is a wide difference of opinion among officers. The Secretary added: "I do not believe at this time we can fix the permanent strength of the Navy and the matter should be delayed. Some of the officers think 500 men sufficient, others 1200 and others 1400. I will obtain the views of several officers and then decide what should be the complement of each ship." A discussion as to the complement of British ships disclosed the fact that British ships, of equal class with the American, had much smaller complements. The Secretary stated he had always believed that American ships had too many men aboard. During the war it was necessary, perhaps, to overcrowd the ships because men were carried for training purposes, replacements, etc. The Secretary submitted a table showing the complement of ships set aside when they were designed, what they carried in 1915, and the enlisted complement at the present time. The New York, for example, was designed to carry a complement of 902 men; in 1915 she carried 1904, and at present 1444, exclusive of Marines.

The Secretary read a Memorandum which stated that it seemed to be universally agreed by naval experts that, in passing from the pre Dreadnought class of battleship to the Dreadnought, a reduction in the cost of maintenance would result because the small ship with a great number of small calibre guns required a larger complement; and because the change from the coal burning to the fuel oil burning battleship would reduce the number of men in the engineers' force. Notwithstanding these predictions complements have been constantly increasing. When the plans ware laid down such ships as the Pennsylvania and Arizona were designed to carry 937 men, but the number of enlisted men actually on board to-day is 1440 for the Pennsylvania and 1540 for the Arizona. A Board on complements will probably recommend a complement of about 1240 men for the Pennsylvania and Arizona. The division commander of the American forces operating with the British Grand Fleet had forwarded a criticism to the Department, stating that the men were crowded and "packed like sardines in the tin, two and three deep at times, in close, poorly-ventilated berth deck compartments," and recommends that no more changes be made in the ship where the change would encroach upon the space for the crew. "After careful investigation," Mr. Daniels said, "I am of the opinion that the battleship of to-day can be operated efficiently with smaller complements."

Promotion by Selection.

Perhaps the most important amendment affecting the commissioned *personnel* of the Navy was here proposed, relating to promotion by selection. Before presenting

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it, the Secretary said: "I do not like the present selection law. It should be made to apply from ensign to admiral." Considerable discussion ensued as to the duties of the present Selection Board, throughout which the members of the committee appeared to be seeking information as to operations of the board and the justice, in the Secretary's opinion, of its selections. Mr. Daniels upheld the board and cited instances to show the absolute fairness of the board's actions. The proposed amendment, which he strongly urged be adopted, reads as follows:

"That part of the Act entitled 'An Act for making appropriations for the naval service for the fiscal year ended June 30, 1917, and for other purposes,' which relates to 'commissioned *personnel*,' wherein it is prescribed that the Board on Selection for promotion shall be convened 'during the month of December of each year, and as soon after the first day of the month as practicable,' is hereby amended so as to read that the board shall be convened 'at such times as the Secretary of the Navy may direct and shall recommend for promotion a number of officers in each grade equal to the number of vacancies in the next higher grade occurring during such period as may be prescribed by the Secretary of the Navy; and such recommendations made by the board shall not be made in the order of seniority but in the order of precedence and rank as determined by the number of votes cast for each officer.'"

Several members of the committee expressed the opinion that merit rather than seniority should be made the basis of promotion, and another suggestion was made that the Selection Board should be changed so that admirals would act as a committee in promoting those ranking below them; and that commanders should sit on a board which selected lieutenant-commanders. There was a feeling left after the discussion that the committee might insert such a provision in the Bill.

Four-Year Course at Annapolis.

The Secretary said that it had been decided to abandon the three-year course at the Naval Academy and to return to the four-year. This was in accordance with the advice of naval authorities.

Admiral Sims is to be the president of the Naval War College.

The Secretary gave some details of dry-dock accommodations in the Pacific, tending to show that the facilities would amply care for the enlarged Pacific fleet he plans. He continued: "The prime thing is to keep the Navy fit, to have competition to stimulate the officers and men. Every now and then the whole fleet will be in the Atlantic and also in the Pacific, constantly manœuvring. I think this is the biggest step we can take for strengthening our Navy and preventing the slump which always comes after a war."

Extending Selection to Marine Corps.

The Secretary next called attention to a proposed amendment he recommended be incorporated in the Bill relating to the extension of the selection law to the Marine Corps. The proposed amendment follows:

"The provisions of existing laws with reference to promotion by selection in the staff corps of the Navy are hereby extended to include authorised advancement to the rank of major and lieutenant-colonel and colonel in line and staff of Marine Corps under the same conditions in all respects, except as may be necessary to adapt such provisions to the line and staff of the Marine Corps; provided that the Board of Selection shall be composed of not less than five officers of the Marine Corps not below the permanent rank of colonel, at least one of whom shall hold a permanent commission in the staff department, and promotions shall be made on the basis of fitness alone by selection from among the permanent and temporary officers of the grade next below; provided, further, that the requirements for sea service in grade, length of service in grade and maximum age in grade for promotion shall not apply."

Admiral Taylor on Construction Costs.

Admiral Taylor devoted himself to explaining the reasons for the increased cost of the ships yet to be built under the 1916 programme, stating that he estimated the hulls and machinery of the ten battleships and six battle-cruisers provided for in that programme would cost nearly $150,000,000 more than estimated, an increase of almost 50 per cent. He added that, in his opinion, the end of hostilities would not bring any speedy reduction in costs.

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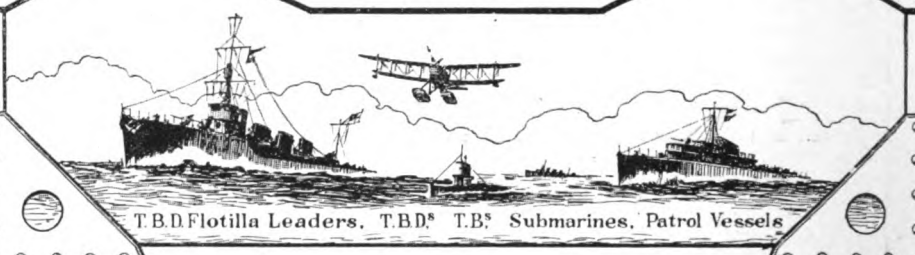

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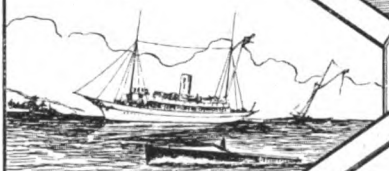

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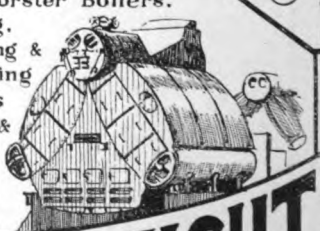

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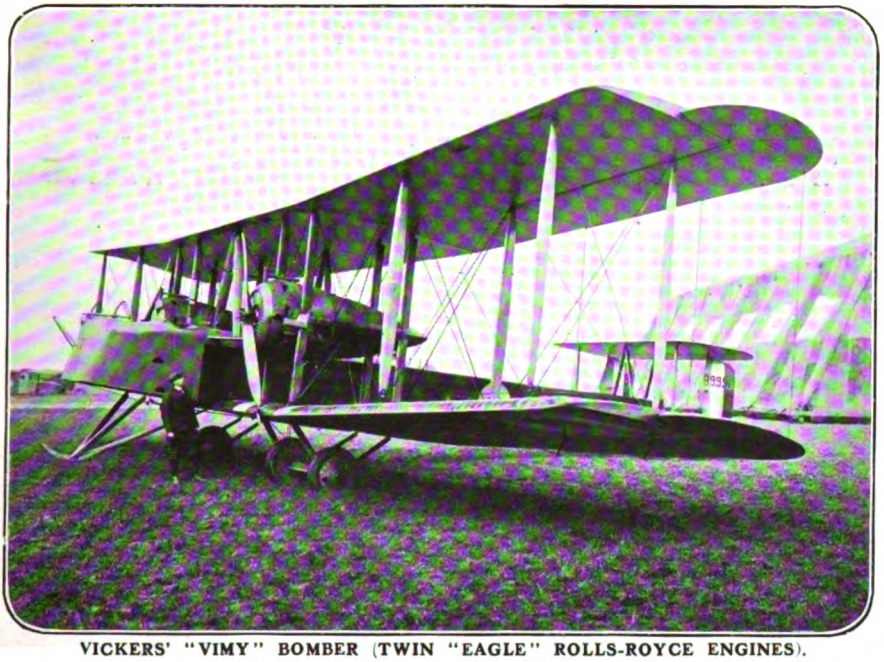

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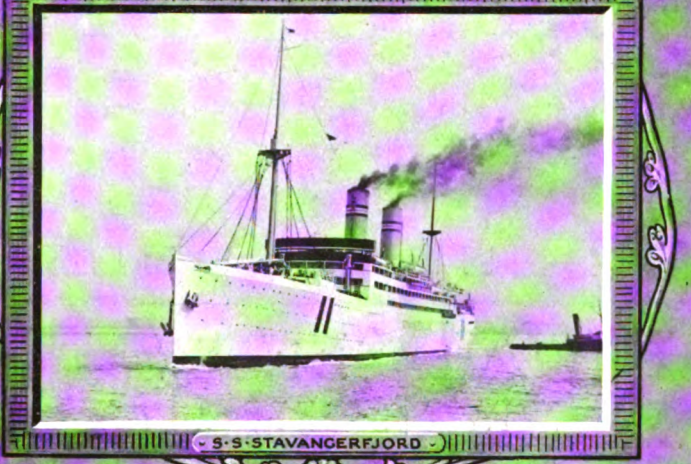

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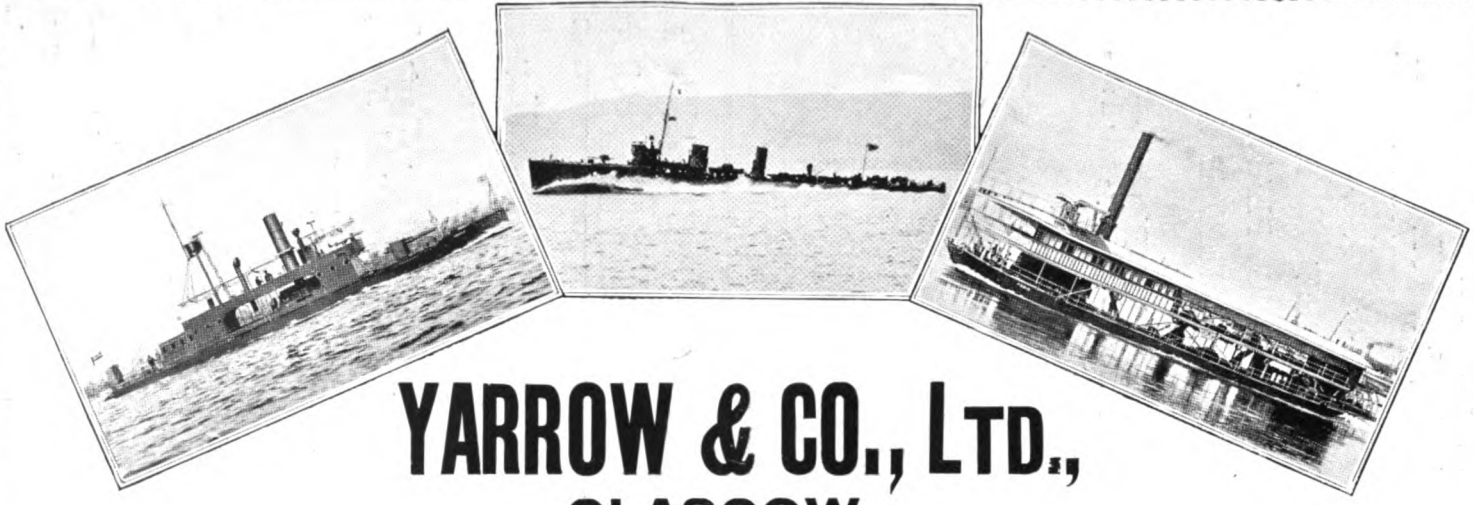

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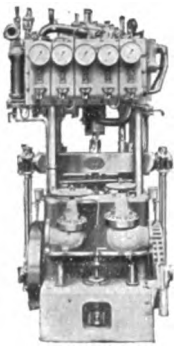

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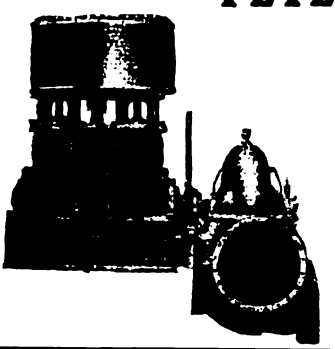

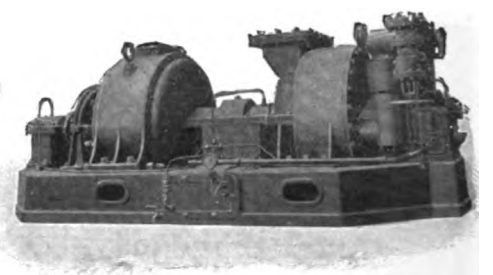

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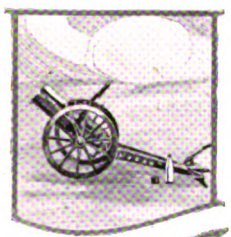

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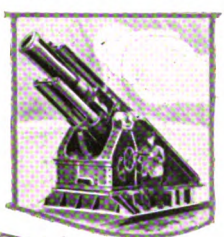

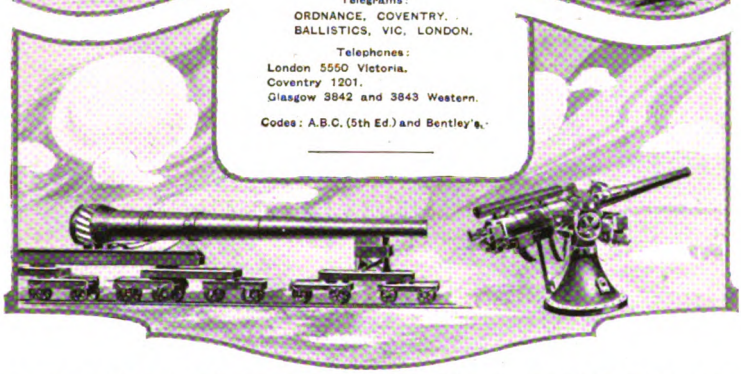

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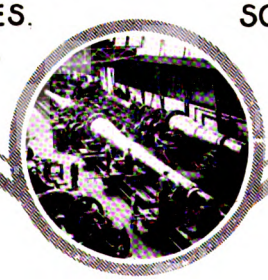

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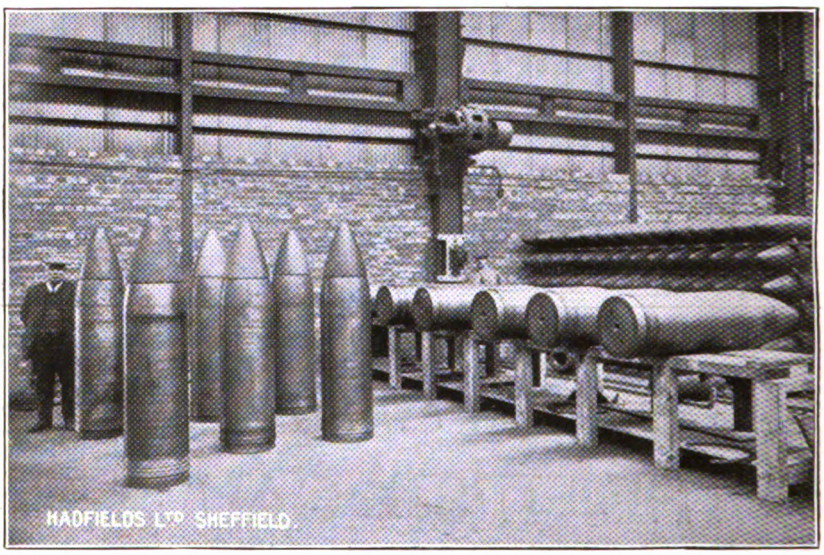

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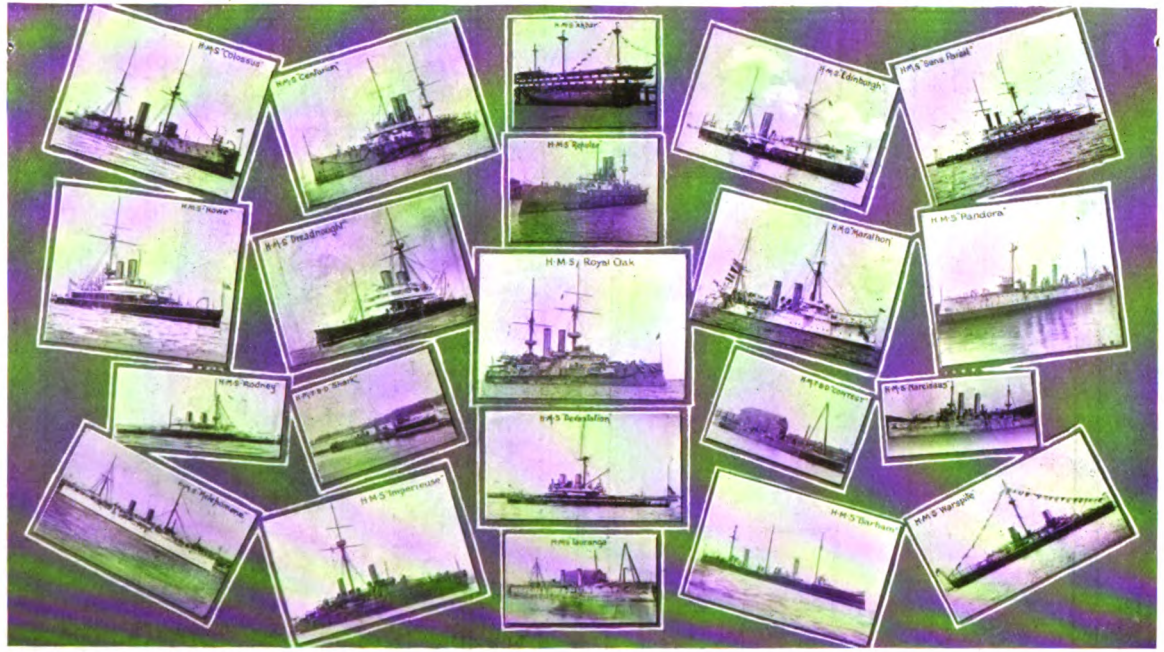

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